



Rhode Island Department of Environmental Management
Office of Water Resources – Shellfish Program

2019 Shellfish Program Classification Report



Growing Area 1

Upper Narragansett Bay 2019

Annual Update

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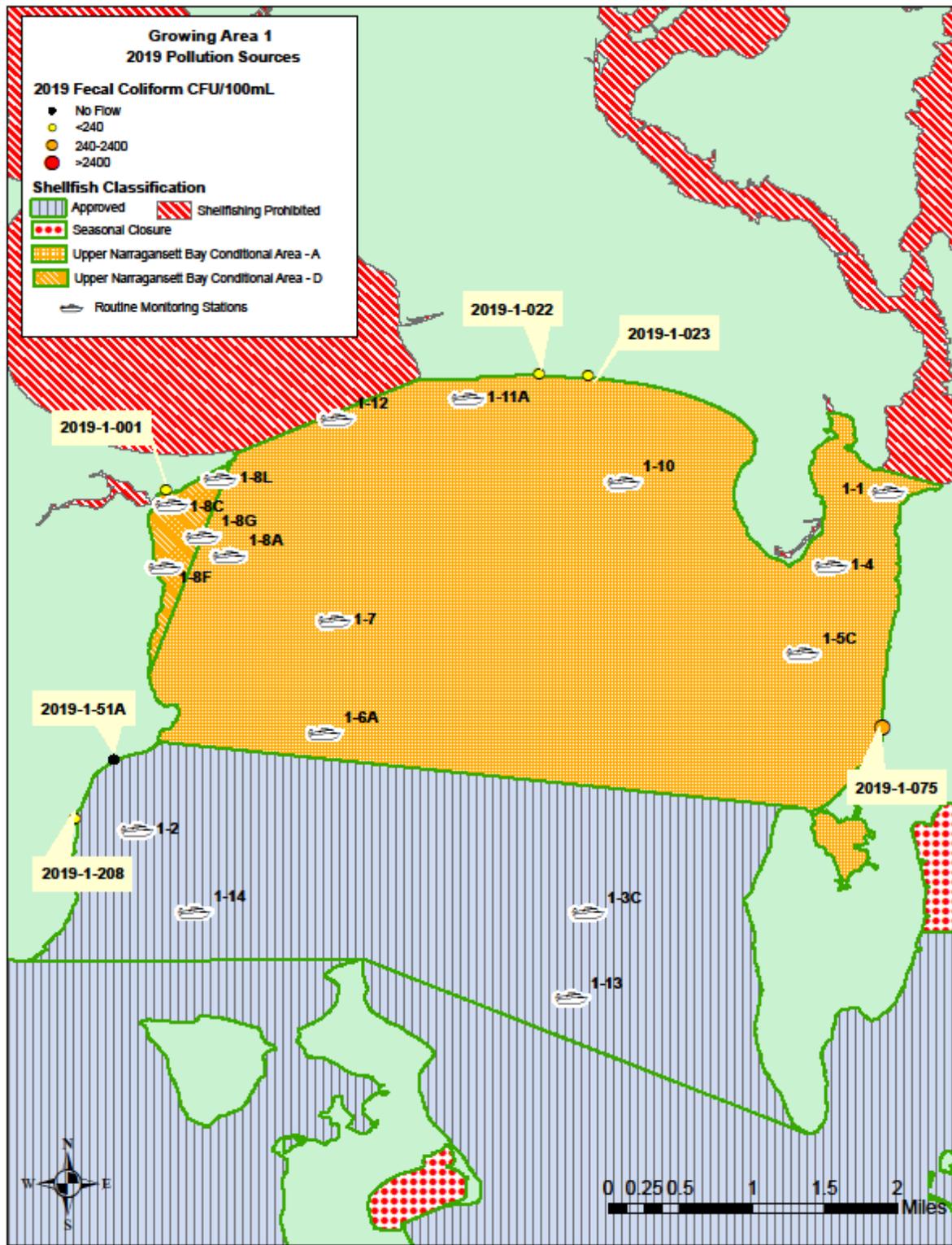
1. Introduction

A twelve (12) year sanitary survey of the Upper Narragansett Bay Growing Area 1 was conducted in 2009. A triennial update was completed in 2018. A total of seventy- seven (77) actual or potential sources were identified during the 12-year sanitary survey. A total of twenty-eight of the seventy-seven sources were not actively flowing at the time of the shoreline survey with the remaining forty-nine having flows warranting sampling. The 2009 12-year survey identified two (2) sources that were greater than the 2,400 mpn/100 ml threshold at the time warranting annual follow ups. In 2019 follow-up sampling was done of six (6) sources of actual or potential pollution that were identified in the 2009 shoreline survey report to be elevated but less than the 2,400 mpn/100 mL threshold. Each of these sources had results that were equal to or exceeded the recommended follow-up threshold of 240 MPN outlined in the shellfish programs standard operating procedures when sampled in 2009 for the triennial update. Of those six sources, none of the results exceeded 2400 cfu/100ml requiring follow-up sampling. However, two (2) sources 1-202 and 1-207 originally exhibited elevated bacteria counts in 2009 (above 2,400 mpn) and were resampled for the 2017 annual review. Results from 2017 were 21 cfu/100ml and 450cfu/100ml with a trickle flow. Before the 2017 sample, source 1-207 was visited in 2014 where it was found to have no flow. Given this source’s low flow and that nearby routine monitoring station 1-2 meets NSSP criteria, this source is not impacting the microbial water quality of the growing area.

2. Pollution Source Survey

The 2019 annual shoreline survey took place on 6/10/2019 and 9/11/2019 under dry weather conditions on both dates. For 6/10/2019, there had been virtually no rain (0.07” measured at KPVD weather station at TF Green Airport) in the seven days prior to the shoreline survey and for 9/11/2019 there had been only 0.01” rain in the seven days prior to shoreline sampling. Six (6) sources (1-001, 1-022, 1-023, 1-051A, 1-075, 1-208,) were revisited and sampled (Table 1). One (1) source (2019-1-051A) of the six (6) sources did not have flow. Five (5) of the sources had flow and were sampled at the time of the survey. Four of the five sources that were sampled had bacteria counts below 2,400cfu/100ml, which does not warrant follow-up sampling. The highest result was 300 cfu/100mL observed at source 2019-1-075.

Figure 1: 2019-2020 Pollution Sources in GA1



Source 2019-1-001 (Figure 2) is a stream that's 10 ft wide by 3 inches deep draining a small marsh that flows into the downstream portion of Buckeye Brook also referred to as Old Mill Creek before entering Upper Narragansett Bay. In 2018 this source was sampled with a fecal coliform result of >1600. When resampled in 2019 the source had a result of 100 cfu/100ml. The receiving waters of source 2019-1-001, Old Mill Creek, are prohibited. Old Mill Creek which is the outlet of Buckeye Brook flows into the Conditionally Approved waters of Upper Bay Conditional Area D. Since source 2019-1-001 was less than 240 cfu/100 ml this source does not require annual follow up sampling.

Figure 2: Source 2019-1-001



Figure 3: Source 2019-1-075



The only source sampled during this annual survey that was over the 240 cfu/100mL threshold was source 2019-1-075 (Figure 3), with a result of 300 cfu/100ml. This source is a 36" diameter corrugated plastic pipe that is placed in a seawall at the end of Fales Road in Bristol RI (Figure 4). The source flows directly into conditionally approved waters of Upper Narragansett Bay Area A. However, the flow of this source is very minimal, 0.02 cfs and must flow across a short portion of sand before reaching receiving waters. This source had a flow rate of only 0.02 cfs during dry weather and is not believed to impact the waters of GA1 when it is in the open status (dry weather). This source will be followed up on the next annual survey.

The Upper Narragansett Bay Growing Area 1 was reclassified in May 2017, due to improvements in water quality after the Narragansett Bay Commission (NBC) completed Phase I and II of the CSO project which captures combined sewage in a tunnel for pump back and treatment at the Fields Point WWTF. The "Conditionally Approved" "Area B" was reclassified to "Approved" after additional wet weather monitoring showed significant improvements in bacteria levels and met NSSP criteria for Approved Shellfish Growing Areas. The Growing Area 1 conditionally approved subarea "Conimicut Triangle" was merged with Growing Area 1 conditionally approved subarea "1A." Wet weather sampling and data analysis showed improvements in water quality to both conditionally approved subareas after the NBC WWTF completed of Phase I and II of the NBC CSO project, which allowed for the merge of the two subareas. The rainfall closure threshold was also increased in the conditionally

approved “Area A” from 0.8 to 1.2 inches. Refer to the revised Conditional Area Management Plan (CAMP), Addendum # 3 dated July 2017 for the analysis of wet weather sampling and the rationale for re- classification of Area “B” and the revised rain criteria for Area “A”.

A sewer line break near the Cedar Swamp pump station in Warwick upstream of GA1 on 8/26/2018 resulted in a discharge of approximately 300,000 gallons of untreated sewage to Buckeye Brook. An emergency shellfishing closure was enacted for the area. Following the sewer line break, fecal coliform levels in Buckeye Brook were monitored by Warwick Sewer Authority and DEM staff to document remediation efforts in the area and to evaluate Buckeye Brook as a fecal coliform source to the shellfishing waters of Upper Narragansett Bay near the mouth of Buckeye Brook and Old Mill Creek. After extensive monitoring over 3 months, during which time the area remained closed to shellfishing during a very wet September to December, almost 2x the average amount of rain during that time period, a new conditional area labeled “Area 1D” was implemented in January 2019 to protect the receiving waters from high bacterial levels. The area is described as follows, all waters of Upper Narragansett Bay west of a line from the Rhode Island Department of Environmental Management range marker located on a pole on Conimicut Point to the extension of Ogden Avenue in Warwick excluding those waters of Old Mill Creek in their entirety Available data suggests that a rainfall closure threshold of 0.80” is protective of public health in the area of the Conditional Area 1D. Conditional Area “D” will close for seven days after 0.8” or more of rain or snow melt within any 24-hour period. Initially 18 stations were established and sampled to classify this conditional area, as sampling continued, the list of stations gradually decreased to a total of 4 stations (8C, 8F, 8G, 8L) which were used to monitor this conditional area during 2019 (Figure 5).

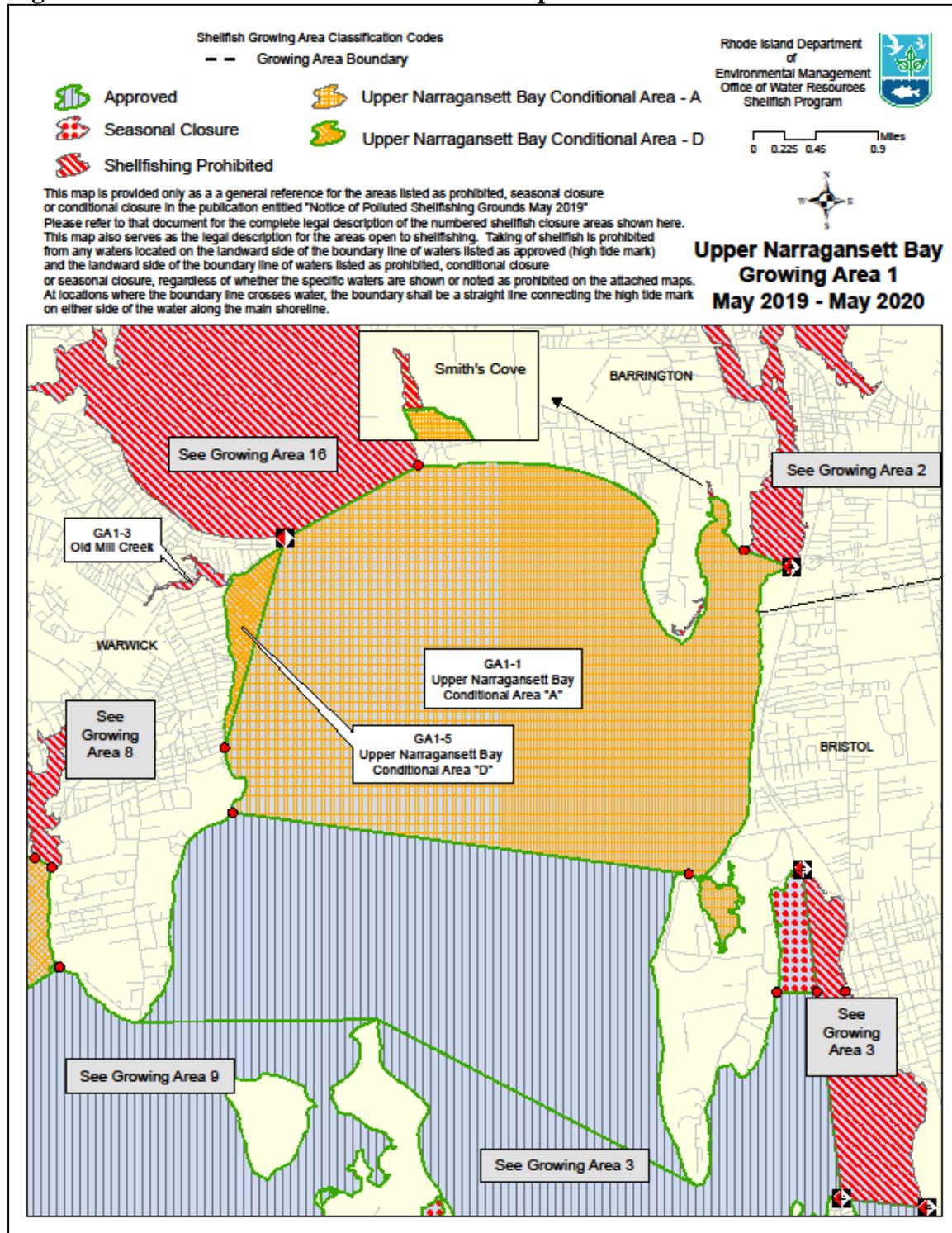
Table 1: 2019 Summary of Pollution Sources in GA 1

*Highlighted sources >240 CFU/100ml.

Source ID	Date Visited	Lat	Long	Description	Receiving waters classification	Act /Pot	Dir /Ind	2018 Results mTEC cfu/100ml	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
2019-1-001	9/11/2019	41.71385	-71.3645	Stream flowing into outflow of Buckeye Brook at Old Mill Creek into upper bay	Prohibited	Actual	Direct	>1600	100	2.04
2019-1-022	6/10/2019	41.72561	-71.3271	tidal stream from upland marsh west end Barrington beach @ RICC	Conditionally Approved	Actual	Direct	24	15	0.07
2019-1-023	6/10/2019	41.72536	-71.3222	tidal stream from upland marsh east of RICC	Conditionally Approved	Actual	Direct	700	68	0.203
2019-1-51A	9/11/2019	41.68684	-71.3697	Stream from uplands, not present in 2019	Approved	Potential	Direct	NS	NS	NF
2019-1-075	9/11/2019	41.69008	-71.2927	36" diameter CMP	Conditionally Approved	Actual	Direct	>1600, 12	300	0.02
2019-1-208	9/11/2019	41.68099	-71.3736	8" iron pipe	Approved	Actual	Direct	1300	27,<2	trickle

IS = In stream sample NS = Not sampled NF = No flow CNL = Could not locate

Figure 4: 2019-2020 Shellfish Classification Map of GA 1



3. Marinas and Mooring Fields

The Upper Narragansett Bay Growing Area 1 does not contain any marinas. During sanitary surveys moorings are to be noted. Moorings in Smith Cove and north of Bristol Town Beach were evaluated during the survey and determined to have no impact on the classification of waters within the Upper Bay.

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Upper Narragansett Bay due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

4. Waste Water Treatment Facilities

There are currently no wastewater treatment facilities that discharge directly to this growing area; however several existing plants discharge into the Providence and Warren rivers upstream of this area and have an indirect impact on the water quality of the upper bay.

On the Providence River, three facilities have permitted discharges, the Narragansett Bay Commission's (NBC) Fields Point and Bucklin Point (Seekonk River upstream of Providence River) facilities and the city of East Providence's wastewater treatment facility.

The Fields Point facility is permitted to discharge a maximum of 65 million gallons per day (MGD) of flow to secondary treatment. In 2019 average flow was 46.5 MGD. The Bucklin Point facility is permitted to discharge 31 MGD and averaged 21.83 MGD also below permit limits. Bucklin Point had 3 violations in 2019 all for exceeding daily cyanide limits of 10.0 ug/L. On 8/20/2019 the facility had a release of 20.8 ug/L, 9/17/2019 had a release of 15.5 ug/L, and 10/22/2019 had a release of 14.3 ug/L.

The East Providence facility is permitted to discharge 14.2 MGD and the average discharges for 2019 were 6.88 MGD well within permit limits. No fecal coliform or flow violations were reported by this facility.

The Warren wastewater treatment facility discharges to the Warren River which is a tributary to this growing area and has a permit limit of 3.43 MGD from November 1st to April 30th, and a permit limit of 2.53 MGD from May 1st- October 31st. In 2019 the monthly average flow was 2.02 MGD which is within permit limits. Warren’s permit has changed, and they no longer have a permitted fecal coliform maximum. Reporting criteria has now changed to Enterococci. There were five enterococci permit violations in 2019 and an additional 6 violations of other permitted limits, all violations are included in Table 2. This facility has plans to upgrade their secondary treatment system to meet their total nitrogen permit requirement.

Table 2: Warren WWTF 2019 Violations

Daily Max Enterococci	1/30/2019	1,733 MPN/100 mL vs limit of 276 MPN/100 mL
Daily Max Chlorine	1/30/2019	303 ug/L vs limit of 267 ug/L
Daily Max Enterococci	7/23/2019	579 MPN/100 mL vs limit of 276 MPN/100 mL
Daily Max Enterococci	9/10/2019	24,000,000 MPN/100 mL vs limit of 276 MPN/100 mL
Daily Max Enterococci	9/11/2019	24,000,000 MPN/100 mL vs limit of 276 MPN/100 mL
Daily Max Enterococci	9/12/2019	24,196 MPN/100 mL vs limit of 276 MPN/100 mL
High daily fecal	9/12/2019	34,100 MPN/100 mL. There is no permit limit for fecal.
Monthly Ave. Entero	9/2019	39 MPN/100 mL vs limit of 35 MPN/100 mL
Daily Max TSS	12/1/2019	44 mg/L vs limit of 29.3 mg/L
Daily Max TSS	12/2/2019	48 mg/L vs limit of 29.3 mg/L
Daily Max TSS Load	12/3/2019	983 lb/d vs limit of 838 mg/L

The confluence of the Pawtuxet River and Narragansett Bay is approximately three miles north of this growing area. Three treatment facilities have permitted discharges to the Pawtuxet River, and as a result the Pawtuxet is a potential source of pollution to Narragansett Bay and this growing area. Cranston, Warwick and West Warwick all operate wastewater treatment facilities that discharge effluent. West Warwick’s permitted flow of 10.5 MGD was not exceeded with average flows of 6.09 MGD with no violations reported in 2019. Cranston had one reported violation for 2019, a minimum daily pH of 5.9 SU as opposed to the permitted 6.0 SU. They maintained average flows of 8.77 MGD. Warwick’s average monthly flow was 5.08 MGD, well below the permitted flow of 7.7 MGD, with no violations reported in 2019.

The northern waters of GA1, Upper Narragansett Bay are conditionally managed with routine closures instituted following specific precipitation events as outlined in the Conditional Area

Management Plan (CAMP). Additional historical routine closures based on upstream wastewater treatment facility bypasses of wet weather effluent are also included in the current CAMP. The two NBC facilities in the Seekonk and Providence Rivers, Bucklin Point and Fields Point respectfully have completed extensive upgrades to treatment methods and have also constructed major combined sewer overflow abatement projects since these historic routine closure triggers were implemented. Beginning in 2018 the shellfish program began a reassessment of the potential impacts these WWTF may have on the downstream waters of the Upper Narragansett Bay with the goal of eliminating or reducing the specific trigger conditions that cause routine wet weather closures. This analytical report is not contained in this document but rather is a standalone document entitled “Classification of Shellfish Growing Waters of the Upper Narragansett Bay Adjacent to Waste Water Treatment Facilities” and is housed in the program’s permanent files, available for review upon request. Once this analysis is completed the CAMP will be modified to incorporate these changes to the routine wet weather closure triggers for the conditionally approved portions of the growing area.

5. Water Quality Studies

2019 Review of Growing Area Statistics

HIGHLIGHTS

Upper Bay - Area 1A

- * Area A sampled 11X in 2019 season (10X during 2019, 1X during January 2020); all samples collected while the area was in the open status.
- * Statistics represent most recent data collected 8/27/2018 to 1/9/2020 (n = 15) for Area 1A.
- * All conditionally approved areas in compliance.
- * Conditional Area 1D created in January 2019.
- * Stations 1-8C, 1-8F, 1-8G and 1-8L added in Area 1D near Buckeye Brook and Old Mill Creek.
- * Data run 2/14/2020.

Upper Bay – southern section (former Area B)

- * Improvements in water quality resulted in a change in classification of the southern portion of the Upper Bay (formerly known as Area B) from conditionally approved to approved on May 27, 2017.
- * Area B sampled 8X during 2019 (5 wet and 3 dry weather).
- * Statistics for stations 1-2, 1-3C, 1-13 and 1-14 represent recent 30 samples collected during 7/10/2017 or 8/15/2017 to 10/15/2019 under all weather conditions (16 wet and 14 dry weather samples).
- * All approved stations in area in compliance.
- * Data run 2/14/2020.

COMMENTARY

Area 1A and 1D: Upper Narragansett Bay Conditional Area 1A (Growing Area 1A) and Conditional Area 1D were sampled eleven times during 2019 and once during January 2020 while in the open status. The area was not sampled during November 2019 due to required repairs on the sampling vessel. All 2019 samples were collected when the area was in the open status. The 2019 statistical review demonstrated that all conditionally approved station in Upper Bay Area 1A and Upper Bay Area 1D met fecal coliform water quality criteria while the area was in the open status and that the area is properly classified.

Area 1B: Upgrades of wastewater treatment and storm water facilities in the Providence area resulted in improved fecal coliform water quality and a change in the classification of the southern portion of the Upper Bay (formerly known as Area B) from conditionally approved to approved in May 2017. Subsequent sampling of the four stations (1-2, 1-3C, 1-13, 1-14) in the southern portion of the Upper Bay followed the systematic random sampling protocol recommended by the NSSP for approved areas. The southern portion of the Upper Bay (Area 1B) was sampled eight times (5 wet weather and 3 dry weather) during 2019, exceeding minimum sampling requirements for approved areas. The Providence area received slightly greater than average rainfall during 2019 (2019 had 51.97” inches precipitation compared to a long-term average of 49.01” at TF Green Airport, KPVD). A single set of elevated fecal coliform results (collected 10/31/2017, 1 day after 2.34” rain) resulted in the 90th percentile being moderately elevated but still well below NSSP variability criteria at station 1-3C. The southern portion of the Upper Bay Area 1B) met criteria for approved waters during 2019. The 2019

statistical summary demonstrated that the southern portion of the Upper Bay (former Area B) is properly classified as Approved.

RIDEM SHELLFISH GROWING AREA MONITORING: GA1

Upper Bay Area 1A when open (8/27/2018 to 1/9/2020, all mTEC)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA1-1	CA	15	2.9	0.0
GA1-4	CA	15	3.3	0.0
GA1-5C	CA	15	2.0	0.0
GA1-6A	CA	15	2.8	0.0
GA1-7	CA	15	3.1	0.0
GA1-8A	CA	15	2.4	0.0
GA1-10	CA	15	2.8	0.0
GA1-11A	CA	15	3.6	0.0
GA1-12	CA	15	3.9	0.0

Upper Bay Area 1D when open (10/19/2018 to 1/9/2020; all mTEC)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA1-8C	CA	15	4.4	6.7
GA1-8F	CA	15	2.8	0.0
GA1-8G	CA	15	2.6	0.0
GA1-8L	CA	15	4.1	0.0

Upper Bay (Area 1B; 7/10/2017 or 8/15/2017 to 10/15/2019; all mTEC)

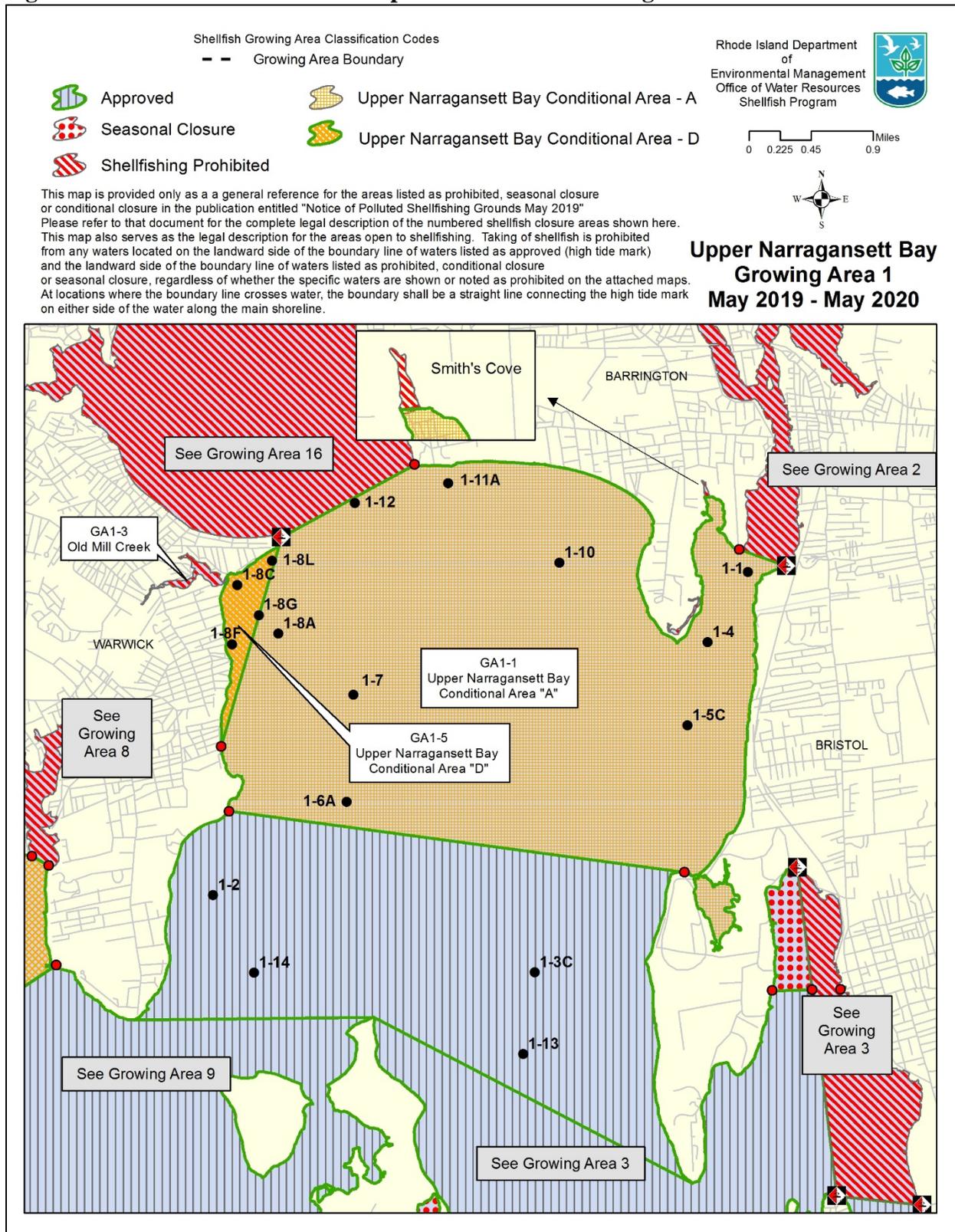
<i>FECAL-GEO</i>					
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<31 cfu)</i>	<i>Weather</i>
GA1-2	A	30	3.2	11.8	16 wet, 14 dry
GA1-3C	A	30	3.7	20.9	16 wet, 14 dry
GA1-13	A	30	3.3	16.7	16 wet, 14 dry
GA1-14	A	30	3.2	13.3	16 wet, 14 dry

6. Summary and Recommendations

- * All conditionally approved stations in compliance and conformance when open.
- * All approved stations in compliance.
- * Continue monitoring Area 1D stations near Buckeye Brook/Old Mill Creek to quantify impacts on shellfish water quality.
- * When possible, continue optional wet weather sampling to track fecal coliform concentration response and to monitor effects of upgrades in wastewater and storm water treatment on Upper Bay water quality.

A review of the current GA1 Management Plan was conducted to ensure compliance and accurate representation of current procedures related to the operation and management of GA1. This assessment indicated no significant deviations from the GA1 management plan. The sources identified and sampled as part of the 2019 annual update of GA 1 indicated that the impact of the sources on the water quality of Upper Narragansett Bay GA1 was minimal and that no changes in the growing area classification are recommended. The Conditional Area Management Plan (CAMP) for the Upper Bay (GA1) was revised to incorporate the creation of Area 1D and to reflect the conditional management changes (0.8" rain threshold) associated with newly created Conditional Area 1D and the recommendations for revised treatment plant bypass triggers as warranted in the previously referenced analytical report.

Figure 5: 2019-2020 classification map and routine monitoring stations.



GA 2
Barrington, Palmer and Warren Rivers
2019 Annual Update

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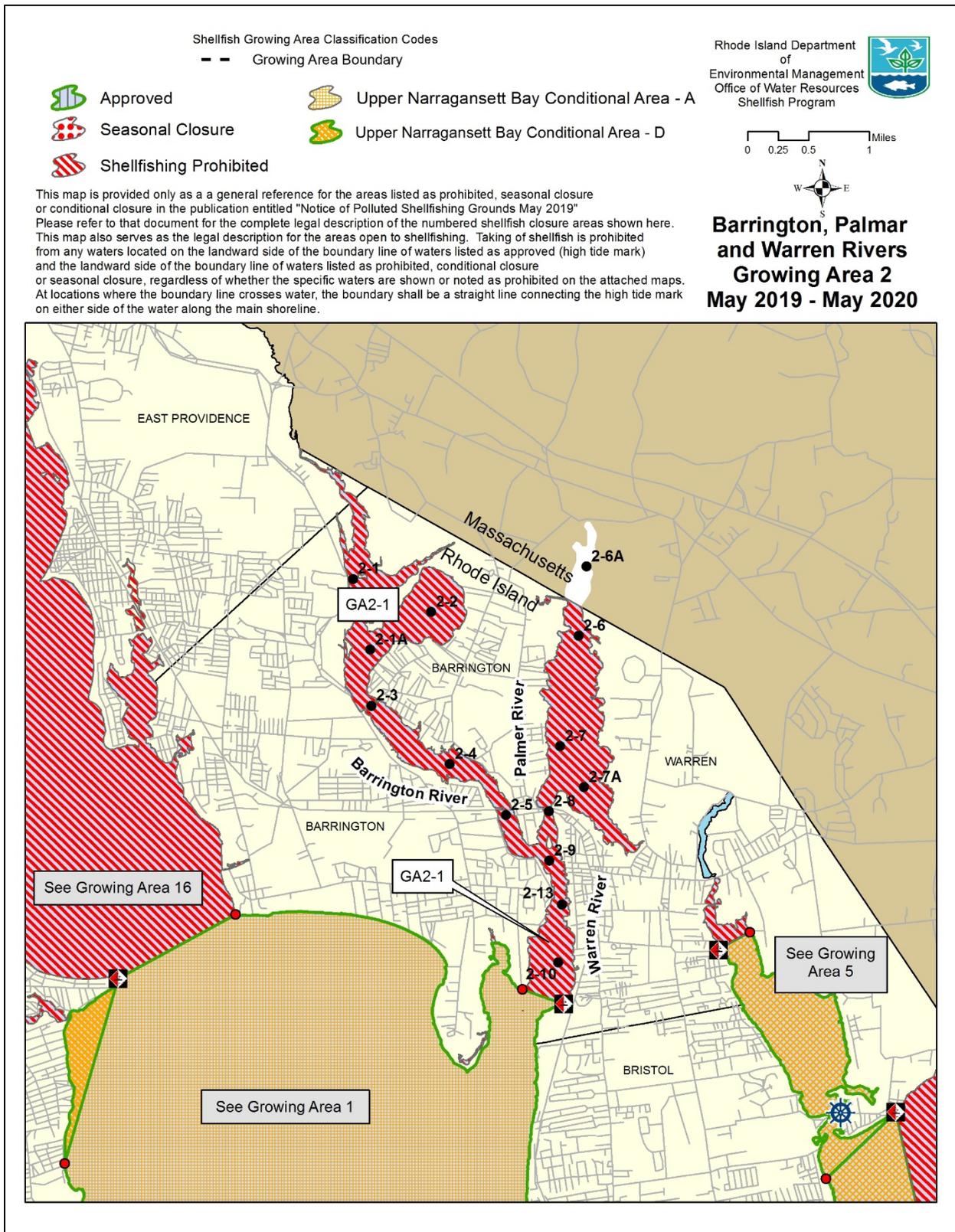
Tables

Table 1. 2019 Statistical Summary for GA2.....	Error! Bookmark not defined.
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1. Introduction

All waters of the Barrington, Palmer and Warren Rivers, Growing Area 2 (Figure 1), are currently classified as prohibited to shellfishing. The area was sampled two (2) times during 2017 (both during wet weather), (5) times during 2018 (1 dry weather, 4 wet weather) and two (2) times in 2019 (one dry, one wet). Results from recent sampling and statistical evaluation indicate that based on the most recent 30 samples collected under all weather conditions ('Approved' status scenario), five (5) of fourteen (14) stations (~36%) are in compliance. Under a 'Conditionally Approved' scenario with a 0.5" rainfall closure trigger, nine (9) of fourteen (14) stations (~64%) comply with NSSP criteria for harvest of molluscan shellfish for direct human consumption. There is no consistent, predictable regional pattern of compliance in the up-river segments of this growing area. Stations that are in compliance during dry weather (i.e., stations 2-2, 2-3, 2-4 in the Barrington River and station 2-7 in the Palmer River) are adjacent to or surrounded by stations that are out of compliance during dry weather. A change from 'Prohibited' status will not be possible until fecal coliform concentrations decline and there is a consistent and predictable regional pattern of stations meeting NSSP criteria in the Barrington and Palmer River portions of Growing Area 2.

Figure 1. 2019-2020 Shellfish Classification Map of GA 2 with Routine Monitoring Stations



A bi-state monitoring effort of the lower Palmer River watershed in Massachusetts, was begun in 2012 and three dry weather surveys of the entire Palmer River watershed were conducted in 2012 and 2013. More recent sampling led by RIDEM and MADEP has targeted specific areas with elevated bacteria concentrations. This included several canoe trips on the lower Palmer River below Shad Factory Pond and targeted sampling along both the main stem lower Palmer River, Torrey Creek, and Rocky Run. In 2015, multiple samples were taken at different tides at eight stations in this target area. While these monitoring efforts have helped to identify specific reaches of the river and its tributaries associated with elevated bacteria levels, they have not been helpful in identifying specific sources. In December 2015, EPA coordinated a meeting between MADEP, RIDEM, EPA, and MA office of NRCS to update organizations on the project and to plan next steps to identify bacteria sources. The discussion of 2016 field work focused on identifying agriculturally related source areas of nutrients and bacteria to help target the NWQI (National Water Quality Initiative) outreach efforts. In the Upper reaches of this growing area extensive study and focus has been initiated, and further work by RIDEM in cooperation with EPA and NRCS still needs to be done to address the impacts noted in the bi-state TMDLs with regards to non-point discharges and agricultural BMPs.

Major accomplishments through the above-mentioned efforts have resulted in completion of several agricultural BMPs having been implemented in the upstream watershed. These mitigation efforts should help to reduce bacteria loadings to the watershed and result in improved water quality. Efforts will be made to sample the growing area more frequently during 2020 to document these results with the goal of re-classifying some of this growing area.

2. Waste Water Treatment Facilities

Growing Area 2 is within the receiving waters of the Warren Wastewater Treatment Facility; analysis to determine the necessary dilution zone for compliance with the NSSP MO is contained in the program's permanent files. EPA's PLUMES model was utilized in determining the extent of impacts of the WWTF discharge in the event of an upset in treatment at the plant should it occur. Performance records of plant treatment quality and records of any unusual events at the plant that would cause a discharge of partially treated sewage are maintained by the department's operations and maintenance division and reported immediately to shellfish staff should such an unlikely event occur. There were no reports of permit violations warranting re-evaluation of the prohibited zone. Upgrades to the Warren WWTF are outlined in the towns Consent Agreement with the state in 2011, which will bring the facility into compliance with its new discharge permit. Construction has been completed and the RI DEM RIPDES program is tentatively waiting for a "substantially complete" date from the Town of Warren. Reevaluation of the dilution analysis previously establishing the prohibited zone for this plant discharge will be completed using any newly permitted design parameters.

In addition to the Warren WWTF there are numerous marinas and mooring fields located within the confines of GA-2, mostly concentrated in the lower reaches of the Warren and Barrington Rivers. As you travel north beyond the bridges of Route 103 water depths and access heights limit the accessibility of larger vessels in the Palmer River and the large shallower coves of the Barrington River. Numerous day use vessels are docked or moored along the riparian shorelines of both rivers. The potential impacts from the existing commercial docks and marinas has been evaluated and waters adjacent to these facilities are within the closed prohibited zones providing adequate protection in the case of any accidental discharges associated with marine vessels. Details of this analysis can be found in the program document entitled "Evaluation of Waters

Adjacent to Marinas – Marine Dilution Analysis Background June 2017.” All waters within GA2 are designated as a “No Discharge Zone”.

3. Water Quality Studies

Annual Statistical Analysis 2019

HIGHLIGHTS

- * Sampled 2X during 2019.
- * Area is currently classified as prohibited; statistics calculated for informational purposes only, not for compliance.
- * Statistics calculated for recent 30 combined wet and dry weather data 7/16/2010 to 9/24/2019, 16 wet weather and 14 dry weather samples; 9 MPN and 21 mTEC samples.
- * Statistics also calculated for recent 15 samples collected during dry weather only (<0.5” rain in prior 7 days) during (6/4/2009 to 9/24/2019); 7 mTEC and 8 MPN.
- * Data run 12/16/2019.

COMMENTARY

The Barrington, Palmer and Warren Rivers (Growing Area 2) were sampled twice during 2019 (1 dry weather, 1 wet weather). The stations in the Barrington River (stations 1-5) and the Palmer River (stations 6-8) were downgraded from conditionally approved to prohibited 16 years ago due to declining water quality. A TMDL study of the area was completed in 2002, with a recommendation to monitor shellfish growing waters to track changes in water quality. Although this area is prohibited for the harvest of shellfish, compliance statistics were run under two scenarios: approved (recent 30 observations) and conditionally approved (recent 15 observations during dry weather; 0.5” rain closure). Only five stations (stations 2-4, 2-5, 2-9, 2-10, 2-13) located in the southern-most Barrington River and in the Warren River met compliance criteria under the approved scenario. Most of these stations are located in marina areas and adjacent to a WWTF outfall which keeps the area classified as prohibited to shellfishing. Under dry weather conditions (less than 0.5” rain in prior 7 days), 9 of 14 stations met criteria, but these stations are located in the lower Barrington and Warren Rivers (marina and WWTF area) or are surrounded by areas that do not meet water quality criteria (examples: stations 2-3 and 2-4 in the Barrington River and station 2-2 in 100-Acre Cove). Up-river stations (1 and 1A in the Barrington River and station 6A in the Palmer River) are also out of compliance during dry weather. TMDL work in RI and MA portions of the watershed continues in an effort to improve water quality. Given current water quality and the unpredictable fecal coliform response after rainfall, the area is properly classified.

RECOMMENDATIONS

- * Maintain closure of the Barrington River and Hundred Acre Cove.
- * Maintain closure of the Palmer River.
- * Complete six (6) systematic random sampling trips per year to support TMDL efforts and to track water quality changes.

RIDEM SHELLFISH GROWING AREA MONITORING: GA2

Approved scenario: recent 30 all weather

(7/16/2010 to 9/24/19; 16 wet and 14 dry weather; 9 MPN / 21 mTEC)

FECAL-GEO

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<36 cfu/100 ml)</i>
GA2-1	P	30	45.0	433.8
GA2-1A	P	30	13.3	133.6
GA2-2	P	30	5.8	36.1
GA2-3	P	30	8.2	44.6
GA2-4	P	30	5.7	31.0
GA2-5	P	30	5.7	26.8
GA2-6	P	30	65.1	875.5
GA2-6A	P	30	163.6	1753.0
GA2-7	P	30	10.0	93.6
GA2-7A	P	30	11.8	135.7
GA2-8	P	30	6.2	32.4
GA2-9	P	30	5.2	21.0
GA2-10	P	30	4.1	14.4
GA2-13	P	30	4.5	17.1

Conditionally Approved scenario: recent 15 dry weather (<0.5" rain prior 7 days) only

(6/4/2009 to 9/24/2019; 11 mTEC, 4 mpn)

FECAL-GEO

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 35 cfu/100 ml</i>
GA2-1	P	15	27.9	40.0
GA2-1A	P	15	8.7	26.7
GA2-2	P	15	3.8	6.7
GA2-3	P	15	5.6	6.7
GA2-4	P	15	4.0	0.0
GA2-5	P	15	4.3	6.7
GA2-6	P	15	29.4	40.0
GA2-6A	P	15	116.2	86.7
GA2-7	P	15	5.8	6.7
GA2-7A	P	15	7.9	13.3
GA2-8	P	15	5.8	0.0
GA2-9	P	15	4.2	0.0
GA2-10	P	15	4.0	6.7
GA2-13	P	15	4.8	6.7

East Middle Bay

Growing Area 3

Triennial Re-Evaluation

2019



Potter Cove, Prudence Island, RI
Photo courtesy of Dave Cleaveland

Rhode Island Department of Environmental Management

Office of Water Resources

Shellfish Monitoring Program

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1.0 Introduction

A triennial re-evaluation shoreline survey of East Middle Bay was conducted in order to comply with National Shellfish Sanitation Program (NSSP) requirements for shellfish growing area classification. The primary objective of the shoreline survey was to identify and characterize sources of pollution affecting the area and re-evaluate point and non-point sources previously identified during prior surveys. This triennial update of Growing Area 3 (Figure 1) was conducted in the fall of 2019. The survey involved follow-up sampling of previously identified sources that had fecal coliform counts exceeding 240 MPN/100ml. These sources were evaluated to determine the bacteriological impact on the growing area.

The survey area encompasses all of the shoreline south of a line from Providence Point on Prudence Island to Poppasquash Point in Bristol, north of a line from the southern tip of Prudence Island to Carr Point in Portsmouth, and west of the Mt. Hope Bridge including Bristol Harbor.

2.0 Description of Growing Area

Growing Area 3 is presently comprised of sections classified as approved, seasonally approved, and prohibited for shellfishing (Figure 1). There is a 658-acre section on the eastern side of Bristol harbor that is prohibited due to influences from a number of commercial and recreational boating facilities and the Bristol Wastewater Treatment Facility and a 349-acre section in the Melville marina area which is also prohibited. The waters south of a line from the Mount Hope Bridge in Bristol to the Hog Island shoal to Arnolds point in Portsmouth are prohibited to shellfishing due to potential for contamination from an upset in operation at the Fall River WWTF in Mt. Hope Bay. Two seasonal closures are currently in effect between Memorial Day weekend and Columbus Day weekend due to a large number of recreational boat facilities and transient moorings in use during peak summer months: one on the western side of Bristol Harbor and the other in Potter Cove on Prudence Island. The two areas measure approximately 94 acres and 105 acres respectively.

Hydrographic Characteristics

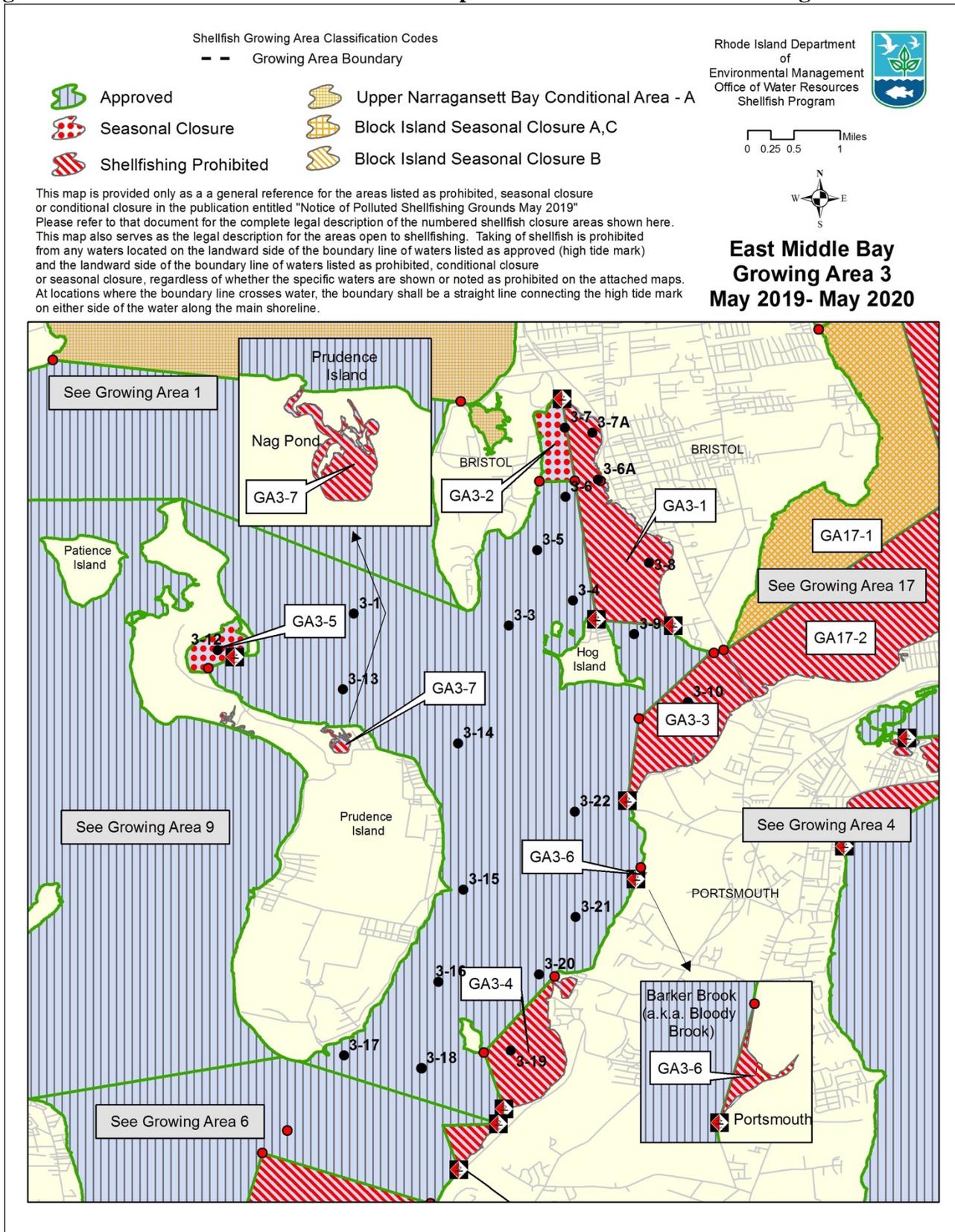
Total area of the East Middle Bay Growing Area 3	9,414	acres
Widest Reach	4.5	miles
Deepest Point	112	feet

The growing area includes Prudence Island of which the majority is protected open space with little or no development, resulting in limited human impacts upon the surrounding ambient water quality. This includes 750 acres of open space on the northern end and 1645 acres of the southern end of the island. The central eastern portion of the island is primarily composed of medium to high-density residential areas which are mostly seasonal in nature due to the remoteness of the island and limited ferry service. The eastern side of the growing area (the Portsmouth mainland) is sparsely developed. The northern part of the growing area includes Bristol Harbor and is more heavily developed with a mix of commercial and residential development. There are currently fourteen (14) marinas operating within the growing area (Figure 6). The two largest are the East Passage Yachting Center with 437 slips and the Little Harbor Marina (Hinkley Yachts) with 100 slips. Both of these facilities are located on the Portsmouth mainland within the confines of the permanently closed shellfishing area in Melville. Each marina that has a fixed pump-out facility that provides marine head pump-out service to boats in the area is shown in figure 6.

Another marina operating within the growing area is the Bristol Marine and Yacht Club (Figure 6). There is a seasonal closure in the northwest portion of Bristol Harbor due to the numerous slips and moorings associated with this marina, 32 for the marina, 10 for the yacht club. In addition to a pump-out boat at the marina, the Town of Bristol operates both a pump-out boat and a fixed dockside pump out facility at the Town Piers (4 marinas) on the east shore of Bristol Harbor. See section 4.0 for more detailed information on marinas in the area, as well as Figure 6 illustrating their locations.

The eastern half of Bristol Harbor is prohibited to shellfishing due to the town docks, numerous moorings, several marinas and the safety closure zone associated with the Bristol Wastewater Treatment Facility that discharges into Walkers Cove (Figure 1).

Figure 1: 2019-2020 Shellfish Classification Map of GA3 with Routine Monitoring Stations



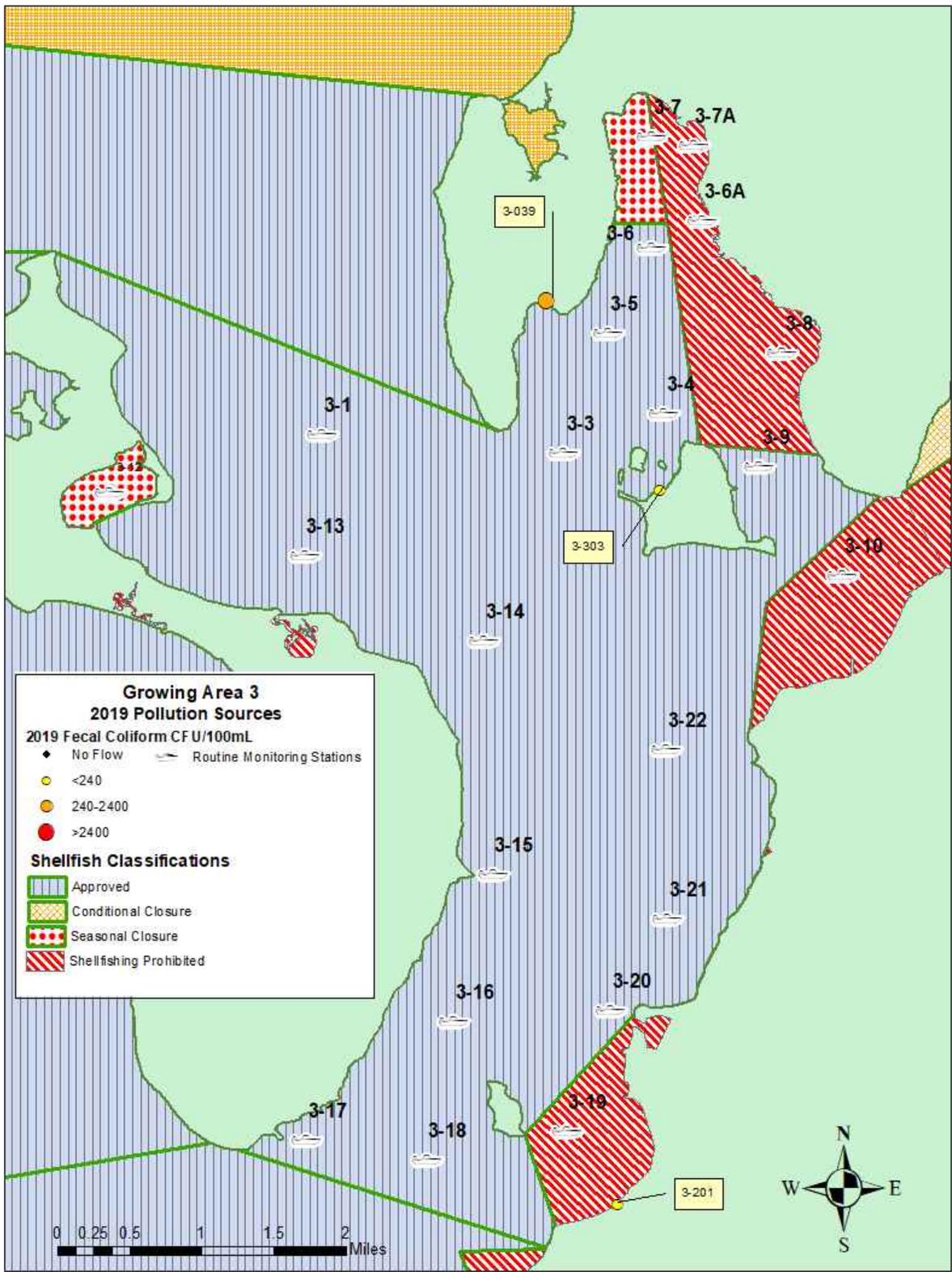
3.0 Pollution Source Survey

3.1 Survey Procedures

Steve Rogers and Steve Engborg of RIDEM Office of Water Resources Shellfish Program, coordinated and conducted shoreline sampling of the East Middle Bay. The subsequent review of the findings and report was compiled by Steve Rogers, Biologist for the RIDEM Office of Water Resources Shellfish Program.

This review involved follow-up sampling on all previously identified sources in which bacterial results from sampling exceeded the 240 MPN/100 ml threshold established in the shellfish programs standard operating procedures. Sterile 125mL bottles were used to collect samples and then stored in a portable cooler (4° C) during field surveys. At the completion of the field day, samples were transported to the Rhode Island Department of Health Laboratories for analysis. The mTEC method as described in *Standard Methods for the Examination of Water and Wastewater* (APHA, 1999) was used to analyze all samples.

Figure 2: GA3 2019 Pollution Source Location



3.2 Identification and Evaluation of Pollution Sources

In 2010, a 12-year sanitary survey of the entire growing area was completed. There were 61 actual or potential sources identified during the shoreline survey. A total of 45 were not actively flowing at the time of the survey with the remaining 16 having flows warranting sampling. Of these 16 flowing sources, six sources exceeded the 240 MPN/100ml threshold and are located within approved areas, thus requiring follow-up sampling in 2019. There were eight sources total with results greater than 240 MPN/100ml, however two discharged into prohibited areas and so were not sampled in 2019.

Follow-up sampling took place in October 2019 and three sources were actively flowing and able to be sampled (2019-3-039, 2019-3-201, and 2019-3-303 which was a new source found in 2018; Table 1). The locations of these sources relative to the growing area is shown in figure 2.

Source 2019-3-039 is a stream draining a wetland area, with a result of 300 cfu/100ml. This source flows indirectly into receiving waters that are Approved with a flow of 0.102 cfs on the day of the shoreline survey (8/14/2019, 1 day after 0.13” rain at TF Green Airport with a total of 0.69” rain in the 7-days prior to the survey). Instream samples collected east and west of the location where the source flows into the receiving waters both had results of <2 cfu/100ml indicating that this source had no negative impact on the fecal coliform water quality of the growing area. Sources 2019-3-201 and 2019-3-303 are streams that flow directly into Approved receiving waters. These sources had results of 100 cfu/100 ml or less indicating that they are not negatively impacting the receiving waters.

Figure 3: Source 2019-3-039



Figure 4: Source 2019-3-201



Figure 5: Source 2019-3-303



**Table 1: 2019 Summary of Pollution Sources in GA3
(Highlighted sources >240 CFU/100ml)**

Source ID	Date Visited	Lat	Long	Description	Receiving Waters Classification	Actual/Potential	Direct/Indirect	2018 Results mTEC cfu/100ml	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
3-039	8/14/2019	41.66195	-71.2952	Stream draining wetland	Approved	Actual	Indirect	220	300	0.102
3-201	8/14/2019	41.57333	-71.2881	Stream at R/R trestle Burma (Defense Dr) Road. In 2017, stream was not flowing into receiving waters. Ended ~50' from shore	Approved	Actual	Direct	440	100	5.1
3-303	8/24/2019	41.64336	-71.2839	Stream draining upland marsh receiving waters near aquaculture farm	Approved	Actual	Direct	1600	<100	1.02

4.0 Mooring Fields and Marinas

There are several recreational and commercial boating areas that have the potential to negatively impact the ambient waters of East Middle Bay (Figure 3). In 1998 the State of Rhode Island designated all their coastal waters as a No Discharge Area (NDA). The Rhode Island waters include territorial seas within three miles of shore, including all of Narragansett Bay. A No Discharge Area is a designated body of water in which the discharge of *treated* and *untreated* boat sewage is prohibited (this does not include greywater or sink water). There are currently four pump out facilities located within the area of Bristol Harbor: Bristol Marina Boat, Stone Harbour Marina, Rockwell Town Pier, and the Bristol Town pump out boat, servicing all surrounding town piers. For additional information refer to the 2019 RIDEM Pump-out Facilities Report which evaluates the area's coverage and status of RI's marine pumpout facilities..

To account for illicit discharges, dilution calculations were completed for all marinas and destination mooring fields in the growing area. *Determination of Marina Buffer Zones using Simple Mixing and Transport Models* (VIMS, 1989) was used as the basis for determining the dilution necessary to be protective in the case of discharge from MSDs (Marine Sanitation Devices), for more information refer to the 2019 Pumpout Report. Eight marinas are located within the prohibited waters of Bristol Harbor, in which the closure area is more than adequate to account for the fecal coliform level resulting from these potential discharges. The two remaining marinas within Bristol Harbor are within the seasonally closed area in the western part of the harbor, which also provides adequate dilution for the summer boating season. One marina located in Portsmouth, Carnegie Abbey Yacht Club. Finally, the two remaining marinas within East Middle Bay are within prohibited classified waters with ample area for dilution. In addition to the slip counts for the identified marinas the numerous moorings located within Bristol harbor were also included in the dilution calculations. For details on these calculated dilution areas and the rationale for assumptions made to complete these calculations, refer to the RIDEM Office of Water Resources Shellfish Program document entitled *Marina Dilution Analysis Background* (June 2017).

5.0 Wastewater Treatment Facilities (WWTF)

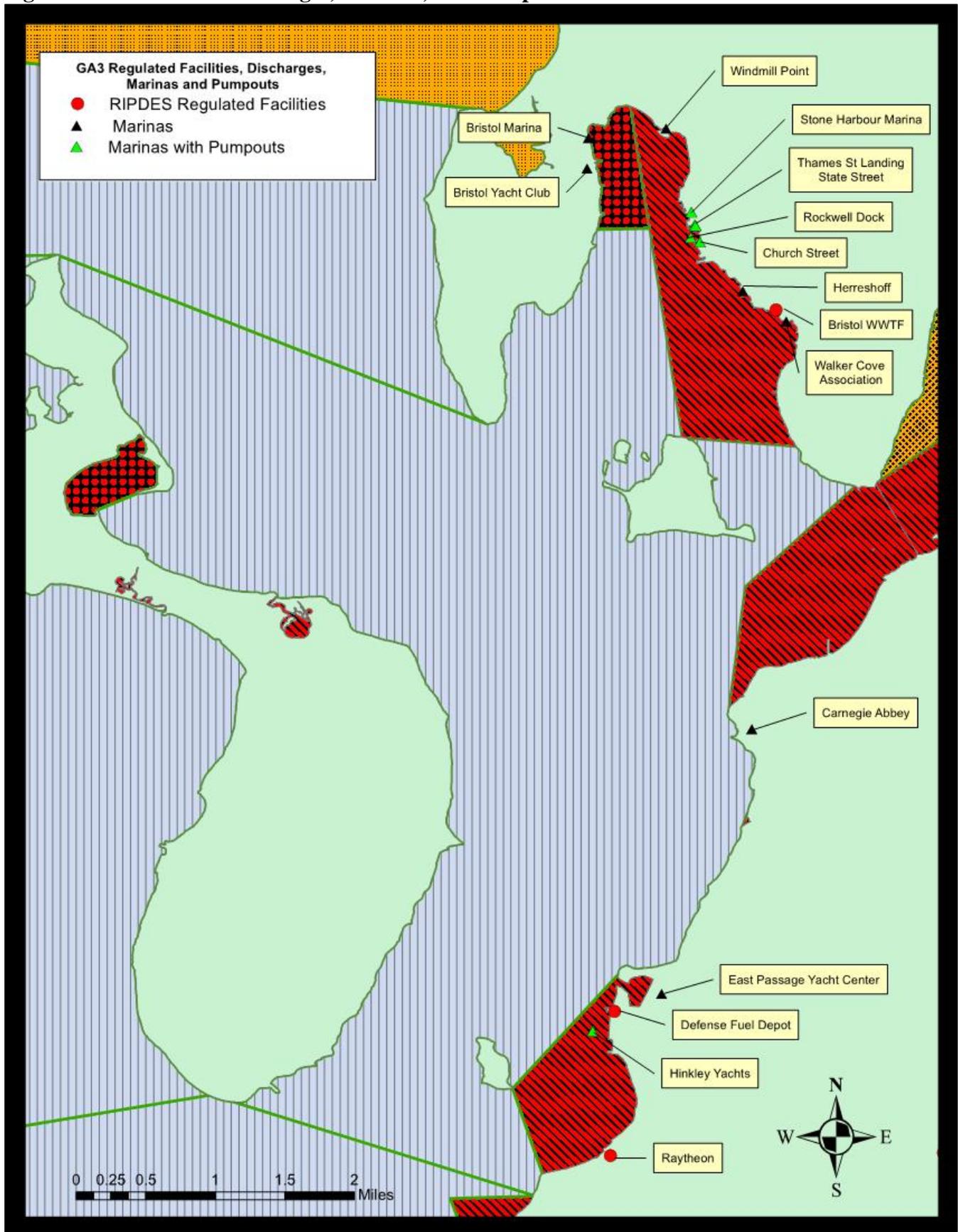
The most significant point source discharge into this growing area is from the Bristol wastewater treatment facility located in Bristol Harbor discharging to Walker Cove (Figure 3). Routine monitoring station 3-8 (Figure 2) is located near this discharge location, and the sample is taken within the discharge plume. The facility is permitted to discharge a maximum daily load of 3.79 MGD (million gallons/day) of treated effluent. The average flow for 2019 was 3.75 MGD, within the permit limits. However, they also reported six monthly flow violations in 2019, an average of 5.19 MGD in January, 4.65 MGD in February, 4.75 MGD in March, 4.87 MGD in April, 4.24 MGD in May, and 5.18 MGD in December. The fecal coliform discharge daily average was 2.98 MPN/100ml, well below the permit limit of 400 MPN/100ml. This WWTF has a monitor only requirement for Fecal Coliform and there was an event on October 23rd, 2019 that had fecal and Enterococci levels to 24,000,000 MPN. The permitted daily max Enterococci amount is 276 MPN. One other daily max violation was accounted for and all violations for 2019 are shown below (Table 2). The Town of Bristol is currently in the process of making improvements to their disinfection system and RI DEM has an active Notice of Violation against the town. Bristol’s ongoing violations has drawn the attention of the EPA, who currently have an ongoing action against the Town of Bristol concerning infiltration and inflow reductions.

Despite the flow violations and occasional effluent bacteria concentration violations described above, monitoring data has indicated that the receiving waters within the closed safety zone near the Bristol WWTF outfall meet NSSP criteria. Station 3-8, in Prohibited waters located in the Bristol WWTF outfall plume, had a geometric mean fecal coliform of 4.1 cfu/100 ml and a 90th percentile of 27.5 cfu/100 ml during 2019. Sentinel stations 3-4 and 3-9, located on the edge of the Bristol WWTF closed safety zone (Figure 2), had 2019 fecal coliform levels well below NSSP standards for Approved waters. This monitoring data indicates that there is sufficient dilution within the Bristol WWTF closed safety zone and that, despite violations during 2019, the Bristol WWTF is not negatively impacting the microbial water quality in the Approved waters of Growing Area 3.

Table 2: Town of Bristol WWTF 2019 Violations

Type	Date	Amount
Daily Max TSS loading	23-Jan-19	2,904.8 lb/day
Average Monthly Flow	January	5.19 MGD
Average Monthly Flow	February	4.65 MGD
Average Monthly Flow	March	4.75 MGD
Average Monthly Flow	April	4.87 MGD
Average Monthly Flow	May	4.24 MGD
Daily Max Fecal*	23-Oct-19	24,000,000 MPN
Daily Max Enterococci	23-Oct-19	24,000,000 MPN
Average Monthly Flow	December	5.18 MGD

Figure 6: Wastewater Discharges, Marinas, and Pumpout Facilities



6.0 Water Quality Studies: Annual Statistical Review of Growing Area Monitoring Results

The Shellfish Growing Area program is a result of the State of Rhode Island's agreement with the US Food and Drug Administration managed National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfish industry. The NSSP is designed to oversee the shellfish producing state's management program and to enforce and maintain industry standards. As part of this agreement, the State of Rhode Island is required to conduct continuous bacteriological monitoring of the growing area in order to maintain certification of these waters for the harvesting of shellfish for direct human consumption.

Water samples are collected at 22 monitoring stations in Growing Area 3 (Figure 1) located in closed, approved, and seasonally approved areas. Sampling runs are conducted by boat a minimum of six times per year during both wet and dry weather conditions. Samples are collected in sterile Nalgene bottles collected 1-2 feet below the water's surface and delivered to the Rhode Island Department of Health laboratories for analysis. In July of 2012, the RIDOH converted from the MPN multi-tube fermentation process to the mTEC membrane filtration method, as described in *Standard Methods for the Examination of Water and Wastewater* (APHA, 1999). All samples in the 2019 compliance data set were analyzed by the mTEC method.

HIGHLIGHTS

- * Sampled 6X during 2019.
- * Statistics represent recent 30 combined wet (n=23) and dry (n=7) weather data 7/28/2015 to 10/15/2019 for approved stations.
- * Statistics represent recent 15 combined wet (n=13) and dry (n=2) weather data when the area was open 4/22/2015 to 10/5/2019 for seasonally approved stations.
- * All approved and conditionally/seasonally approved stations in compliance and conformance.
- * All samples analyzed by mTEC method (90th percentile criteria= 31 cfu / 100 ml).
- * Data run 11/18/2019.

COMMENTARY

All stations in Growing Area 3 (East Middle Bay) were sampled 6 times during 2019, in compliance with systematic random sampling monitoring requirements. The 2019 statistical evaluation includes the most recent 30 samples collected during both wet and dry weather (23 wet, 7 dry weather) since 7/28/2015. Two stations in GA3 (3-7 and 3-12) are classified as seasonally approved. The statistical analysis for these seasonally approved stations includes the most recent 15 samples collected during wet and dry weather (13 wet and 2 dry weather) since 4/22/2015 while the area was in the open status.

All approved stations met criteria during the 2019 evaluation. Results of the 2019 statistical evaluation also indicated that all conditionally approved / seasonally approved stations in Growing Area 3 are in compliance and that the area is properly classified.

RECOMMENDATIONS

- * No action recommended based on 2019 monitoring results.

RIDEM SHELLFISH GROWING AREA MONITORING: GA3

Recent 30 all weather

(7/28/2015 to 10/15/2019; all mTEC, 23 wet and 7 dry weather)

FECAL-GEO				
<u>Station Name</u>	<u>Status</u>	<u>N</u>	<u>MEAN</u>	<u>90th Percentile (<31 cfu/100 ml)</u>
GA3-1	A	30	2.8	8.4
GA3-3	A	30	2.7	6.3
GA3-4	A	30	2.5	5.8
GA3-5	A	30	3.0	12.6
GA3-6	A	30	3.3	14.7
GA3-6A	P	30	4.0	24.4
GA3-7	SA	30	3.6	16.8
GA3-7A	P	30	4.4	31.1
GA3-8	P	30	4.1	27.5
GA3-9	A	30	3.1	11.4
GA3-10	P	30	2.8	7.4
GA3-12	SA	30	2.6	5.5
GA3-13	A	30	2.4	4.9
GA3-14	A	30	2.6	5.8
GA3-15	A	30	2.6	6.4
GA3-16	A	30	2.5	4.8
GA3-17	A	30	2.6	6.6
GA3-18	A	30	2.4	4.9
GA3-19	P	30	2.4	5.0
GA3-20	A	30	2.4	4.4
GA3-21	A	30	2.2	3.4
GA3-22	A	30	2.5	6.6

Seasonally Approved stations, recent 15 when open

(4/22/2015 to 10/15/2019, all mTEC, 13 wet and 2 dry weather)

FECAL-GEO				
<u>Station Name</u>	<u>Status</u>	<u>N</u>	<u>MEAN</u>	<u>%>CRITICAL 31 cfu/100 ml</u>
GA3-7	SA	15	3.1	0
GA3-12	SA	15	2.9	0

7.0 Conclusions and Recommendations

The triennial update of the East Middle Bay (Growing Area 3) reevaluated several potential pollution sources in the study area. However, only one source both met the criteria requiring follow-up sampling and discharges into approved waters, and it has been determined that this source is not negatively impacting the receiving waters of the growing area. The results of this triennial study, routine monitoring, and previous studies of the growing area indicate that the East Middle Bay conforms to all requirements set forth by the National Shellfish Sanitation Program (NSSP) and is properly classified.

No changes in classification are recommended at this time.

An annual update is scheduled for this area for 2020. The next 12-year shoreline sanitary survey is scheduled for 2022.

8.0 References

- American Public Health Association. 1999. *Standard Methods for the Examination of Water and Wastewater*, 20th ed. 1999. American Public Health Association, American Water Works Association, Water Pollution Control Federation. Washington D.C.
- NOAA. June 2016. *Nautical Chart 13221*. National Oceanic and Atmospheric Association, National Ocean Service, Office of Coast Survey. Silver Spring, Maryland.
- Rhode Island Cesspool Act, Rhode Island General Laws. § 19.15-6.
- RIDEM. May 2016. *Notice of Polluted Shellfishing Grounds*. Rhode Island Department of Environmental Management, Office of Water Resources, Shellfish Monitoring Program. Providence, Rhode Island.
- RIDEM. June 2017. *Marina Dilution Analysis Background*. Rhode Island Department of Environmental Management, Office of Water Resources, Shellfish Monitoring Program. Providence, Rhode Island.
- VIMS. June 1989. *Determination of Marina Buffer Zones using Simple Mixing and Transport Models*. Virginia Institute of Marine Science, College of William and Mary. Gloucester Point, Virginia.
- GIS map data provided by: RIDEM, ESRI (Environmental Systems Research Institute), National Geographic

**Sakonnet River
Growing Area 4
Triennial Re-Evaluation
2019**



Sakonnet Harbor, Little Compton, RI
Photo Courtesy of Alexey Sergeev

**Rhode Island Department of Environmental Management
Office of Water Resources
Shellfish Monitoring Program**

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1.0 Introduction

The last 12-year comprehensive shoreline survey of the Sakonnet River was conducted during the summer of 2013 by staff from RIDEM's Office of Water Resources Shellfish Program. The survey involved a shoreline reconnaissance of the study area to locate and catalog pollution sources and collect bacteriological samples from all sources actively flowing into the survey area. A triennial shoreline survey of the area was completed during 2016 with annual updates during each year.

The 2019 triennial shoreline survey was conducted as a re-evaluation of this growing area. As such the survey involved review of previous shoreline surveys including bacteriological sampling of actual pollution sources noted in previous surveys that were found to be equal to or greater than 240 FC/100ml and identification of any new sources of pollution if applicable. These previously identified pollution sources were re-evaluated to determine their bacteriological impacts on the Sakonnet River.

Pipes, groundwater seeps, tributaries, inland inter-tidal, and freshwater discharges that were potential or actual sources of pollution were re-sampled.

2.0 Description of Growing Area

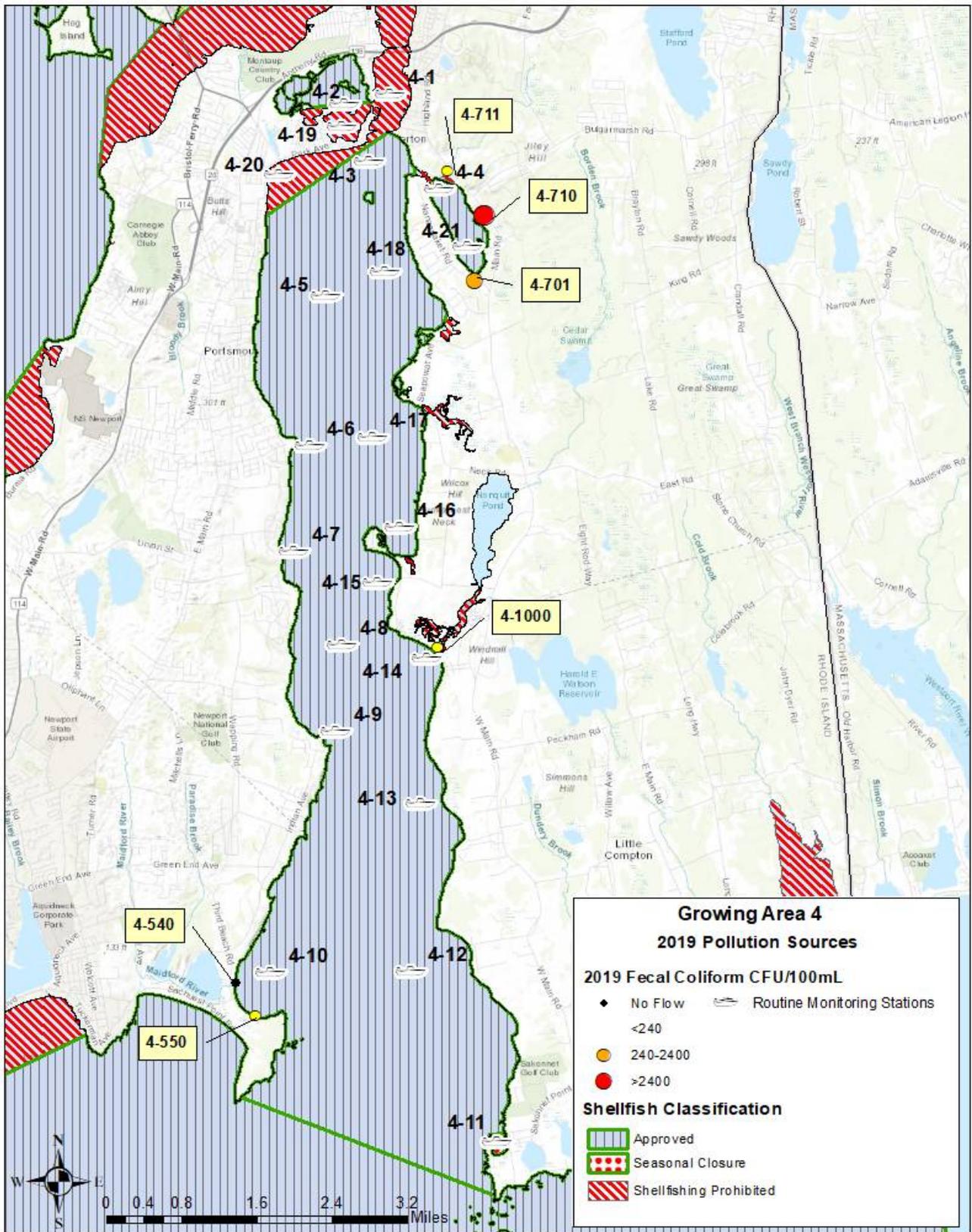
Hydrographic Characteristics

Total area of the Sakonnet River Growing Area 4	12, 954 Acres
Widest Reach	2.8 miles
Deepest Point	66 feet

The Sakonnet River is not actually a river, but the eastern most opening of Narragansett Bay and an inlet of the Atlantic Ocean. This 14-mile-long saltwater strait separates Aquidneck Island on the west from mainland Rhode Island on the east. The communities of Tiverton and Little Compton on the mainland and Portsmouth and Middletown on Aquidneck Island abut this inlet.

Growing Area 4 is presently comprised of sections classified as either approved, seasonally approved, or prohibited for shellfishing (Figure 1). There are several distinct portions of this growing area that are prohibited to shellfishing. The first is the northern boundary of the growing area adjacent to Portsmouth Park, Island Park, and the Hummocks in Portsmouth and encompasses the marina areas along the shore of Tiverton and Portsmouth south of the Sakonnet River Bridge. The second area is the Quaket River and inlet to Nannaquaket Pond including the "Gut." The third is the area referred to as Almy Brook, which flows out of Nonquit Pond at the border between Tiverton and Little Compton. Finally, Sakonnet Harbor in Little Compton is classified as seasonally approved. It is closed during the summer months due to the large number of vessels and commercial fishing docks.

Figure 1: 2019 Pollution Sources and Routine Monitoring Stations in GA4.



3.0 Pollution Source Surveys

The previous 12-yr shoreline sanitary survey was conducted in 2013, with a triennial survey being completed in 2016. A triennial survey was completed in August of 2019 by biologists Steve Rogers and Steve Engborg of RIDEM Office of Water Resources Shellfish Program.

During the 2019 field surveys, sampling was conducted for all sources which had fecal coliform counts that exceeded the 240 FC/100 ml threshold identified in previous surveys. Bacteriological samples were collected from all sources that were actively flowing at the time of the survey. The samples were collected in sterile 125ml Nalgene bottles, stored on ice in a portable cooler and delivered within 6 hours to the Rhode Island Department of Health Laboratory for analysis. The mTEC membrane filtration method, as outlined in *Standard Methods for the Examination of Water and Wastewater* (APHA, 1999), was used to evaluate all water samples.

Most elevated sources from the previous 12 year were either flowing into prohibited waters or having a trickle/minimal flow within recent sampling. Sources sampled during this triennial were mostly sources that were not identified to be high in the previous 12 year but in recent sampling have come back elevated beyond the 240 cfu/100ml threshold. A total of six (6) sources were revisited and sampled if flow was present in this year's triennial survey. Of the six sources sampled this year, 5 of which were found to have been flowing and samples were taken, and one source (2019-4-540) had no flow at the time of sample (Table 1).

Table 1: 2019 Summary of Pollution Sources in GA4

*Highlighted sources >240 CFU/100ml. NF= No flow

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2018 Results mTEC cfu/100ml	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
2019-4-540	8/13/2019	41.4908	-71.2475	Stream from uplands wetland	Approved	P	D	1600	NS	NF
2019-4-550	8/15/2019	41.4856	-71.24352	Outlet from upland tidal pond, 2 gates, pipes submerged, half filled with sand	Approved	A	D	NS	200	Always Submerged partially filled with sand
2019-4-701	8/13/2019	41.6019	-71.1978	Stream at south end of pond at Nannaquaket Road	Approved	A	D	1600	300	TRICKLE
2019-4-710	8/13/2019	41.6124	-71.1959	White Wine Brook at road crossing 24" dia CMP	Approved	A	D	1600	3500	TRICKLE
2019-4-711	8/13/2019	41.6193	-71.2033	Sin & Flesh Brook upstream of gut	Prohibited	A	D	1600	<100	0.75548
2019-4-1000	8/13/2019	41.544	-71.2058	Stream Almy Brook north of town line	Approved	A	D	480	180	80.75

Of the sources re-sampled in 2019, only two had results greater than 240 CFU/100ml. Source 2019-4-710 which is White Wine Brook where it crosses under Route 77 before entering Nannaquaket Pond, had a fecal coliform result of 3,500 CFU/100ml on 8/13/2019. However, this sample was collected during dry weather (no rain prior 4-days and 0.56" rain total in prior 7-days) and the flow rate of this source was only a trickle. A companion instream sample had a result of 58 cfu/100 ml, indicating rapid dilution from this low-flow-rate source.

Source 2019-4-701 is a small stream that enters the south end of Nannaquaket Pond (Figure 1). This source had a result of 300 CFU/100ml on 8/13/2019 during dry weather (no rain prior 4-days and 0.56" rain total in prior 7-days). The flow rate of this source was only a trickle on the sample date. Companion in-stream samples had a result of 56 cfu/100 ml indicating rapid dilution of this low-flow source. As with source 2019-4-710, the low flow rate during dry weather and the fact that nearby monitoring stations 4-4 and 4-21 (Figure 1) met fecal coliform criteria during 2019 indicates that this source has limited negative impact on the water quality of the growing area. Both monitoring stations in Nannaquaket Pond (stations 4-4 and 4-21; Figure 1) met NSSP criteria for approved waters during 2019. Given the low flow rate and that nearby monitoring stations met criteria, these two sources to Nannaquaket Pond appear to have limited impact on microbial water quality in the adjacent growing area during dry weather. However, these sources warrant continued monitoring to ensure that they do not increase fecal coliform loading to Nannaquaket Pond.

Source 2019-4-1000 is Almy Brook, a marshy area that is currently prohibited to shellfishing. This sample had a result of 180 cfu/100mL and a flow of 80.75cfs, a significant flow that has the potential to impact the approved waters it is flowing into. Routine monitoring station 4-14 is located in close proximity to the outlet of this brook. Station 4-14 remains in compliance with a geomean of 3.7, however the variability has been increasing from previous years and this source may be the reason and should be monitored for in 2020.

4.0 Mooring Fields and Marinas

There are several boating areas that have the potential to negatively impact on the ambient waters of the Sakonnet River (Figure 2). The waters north of the Old Stone Bridge are classified as Prohibited. The Sakonnet Harbor (GA4-5) in Little Compton is seasonally approved for shellfishing.

In 1998 the State of Rhode Island designated all their coastal waters as a No Discharge Area (NDA). The Rhode Island waters include territorial seas within three miles of shore, including all of Narragansett Bay. A No Discharge Area is a designated body of water in which the discharge of *treated* and *untreated* boat sewage is prohibited (this does not include greywater or sink water). There are currently three pump out facilities located within Sakonnet River: Brewers Sakonnet Marina, Pirate Cove Marina, and Standish Boat Yard. All are stationary pumpout stations. For additional information refer to the 2019 RIDEM Pump-out Facilities Report which evaluates the area's compliance with Rhode Island's "No Discharge" policies.

To account for illicit discharges, dilution calculations were completed for all marinas and destination mooring fields in the growing area. *Determination of Marina Buffer Zones using Simple Mixing and Transport Models* (VIMS, 1989) was used as the basis for determining the dilution necessary to be protective in the case of discharge from MSDs (Marine Sanitation Devices). Seven marinas are located within the prohibited waters of the growing area, in which the closure areas are more than adequate to account for the fecal coliform level resulting from these potential discharges. Two marinas are located in the seasonally approved area of Sakonnet Harbor, which also provides adequate dilution for the summer boating season. Finally, there is one marina within the approved Nannaquaket Pond portion of the growing area. No slips are used for long-term dockage; the marina is a land based marina used only for day use, loading, and unloading for service or deliveries. Based on this marina type, no dilution area is required. For details on these calculated dilution areas and the rationale for assumptions made to complete these calculations, refer

to the RIDEM Office of Water Resources Shellfish Program document entitled *Marina Dilution Analysis Background* (June 2017).

5.0 Wastewater Treatment Facilities (WWTF)

The majority of the Growing Area 4 shoreline consists of single-family homes most of which use On-site Wastewater Treatment Systems (OWTS) to dispose of wastewater. Public sewers currently service a portion of Middletown near the Sachuest Point area as well as some of Tiverton, primarily in the northern area of the town. The treatment facility for Middletown does not discharge into this growing area but rather into the West Passage of Narragansett Bay (Growing Area 6). Tiverton’s sewer waste is treated by the Fall River Municipal Wastewater Treatment Facility just north of the Tiverton town line which ultimately discharges into Mount Hope Bay (Growing Area 17). The potential impacts from a treatment failure at this WWTF does not extend into the Sakonnet River growing area however the associated protective prohibited safety zone does extend into the northern portion where it merges with the marina closure north of the old stone bridge in Tiverton.

There is currently one RIPDES permits that discharge into the watershed of Growing Area 4 that is a non-sanitary discharge. It should be noted that the portion of the growing area adjacent to Island Park and Portsmouth Park are classified as prohibited due to the high-density residential development and the direct evidence (high fecal coliform counts in dry weather stormwater flows) of failing and marginal septic systems and contaminated groundwater in the area. The majority of OWTS complaints for the Sakonnet River are in the Island Park area. A review of Onsite Wastewater Treatment System (OWTS) complaints and failures was conducted for the 2019 triennial update. There were four complaints within 200ft of the shoreline of waters in the growing area with the potential to affect the receiving waters (Table 2). All complaints had follow-up inspections and all four complaints are either resolved or under resolution (Table 2).

Table 2: OWTS Complaints in Approved Waters of GA4

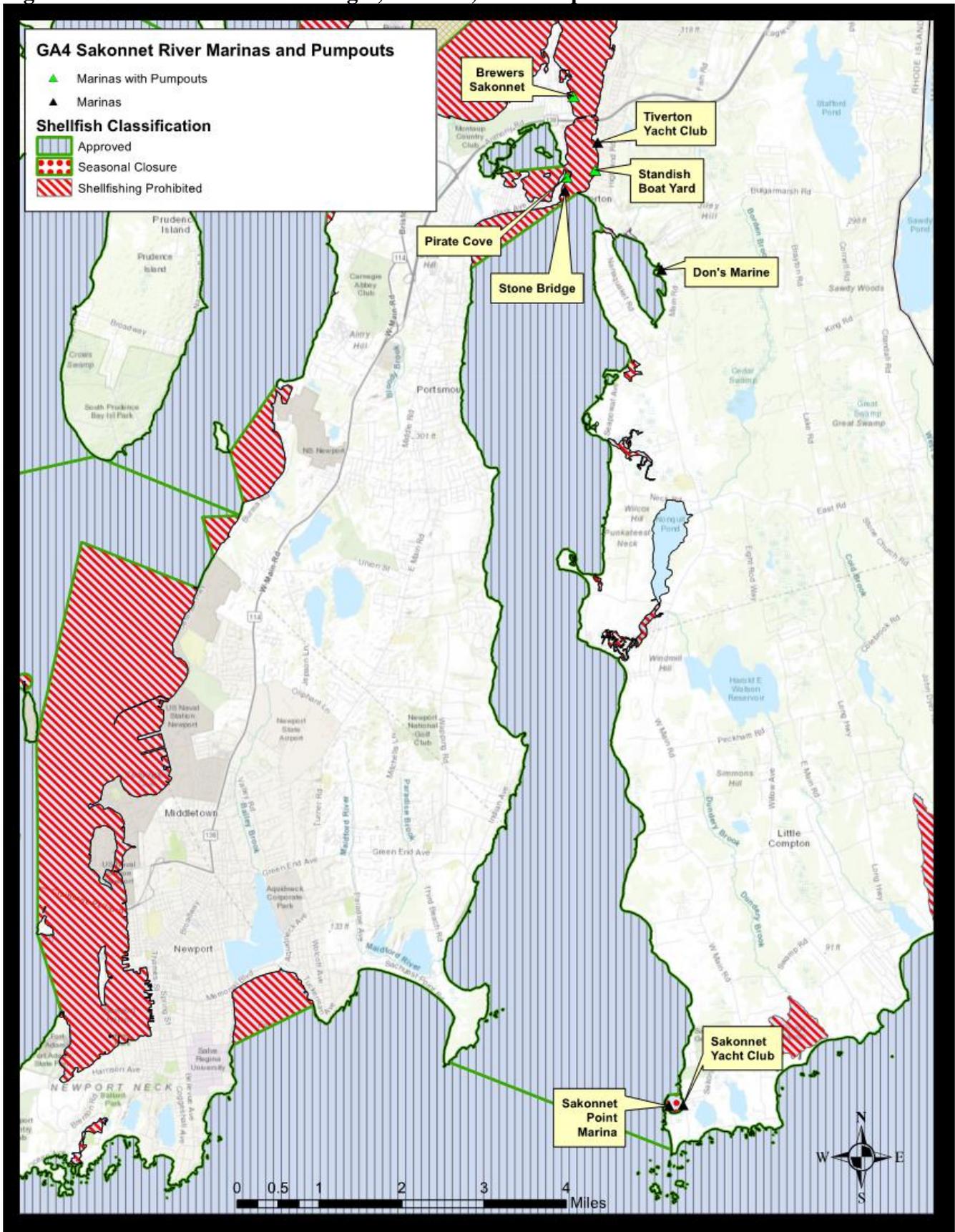
Town	Address	Complaint type	Resolution underway?	Comments
TIVERTON	1520 MAIN RD	Septic overflow	Yes	OC & I inspected and reported non issue
TIVERTON	122 DRIFTWOOD DR	House addition beyond OWTS permit	Yes	OC & I inspected and reported non issue
LITTLE COMPTON	11 BLUFF HEAD AVE	Potential Septic overflow	Yes	OC & I inspected and reported non issue
LITTLE COMPTON	EAST MAIN RD	Failed cesspool which is piped onto neighboring property	Yes	OC & I inspected and reported non issue

The Rhode Island Cesspool act of 2007 requires that any home that is within 200ft of the shoreline of any tidal waters and serviced by a cesspool must have a certified OWTS installed or be connected to the municipality’s sewer system by January 1, 2014 (RI Cesspool Act of 2007, section 19.15-6). Four complaints were filed that could potentially flow into Growing Area 4 (Sakonnet River). One of these complaints (filed for 1520 Main Rd in Tiverton) could potentially impact the prohibited zones of the

northern Sakonnet River (closed marina and mooring area). Two other OWTS complaints have potential to impact approved waters however neither are reported to have reached receiving waters. At 122 Driftwood Drive a house was reported to have a new addition and is beyond its current OWTS permit. On East Main Rd, in Little Compton there was a complaint filed of a failed cesspool that was then piped into a neighboring property. A complaint about possible septic system overflow at 11 Bluff Head Avenue in Little Compton was inspected and resolved and has been deemed to have no potential direct impact on the seasonally approved waters of Sakonnet Harbor (GA 4-5). All OWTS complaints adjacent to GA4 have been inspected by staff in the Office of Compliance and Inspection and determined that they were a non-issue and no further action is required (Table 2).

The majority of the OWTS complaints near prohibited waters were in the Island Park area of Portsmouth. As previously stated, this is a high-density residential area with an ongoing problem of failing septic systems and illicit discharges. This is an issue that the town of Portsmouth is currently working to address. The RI DEM has developed, and the EPA has approved a TMDL for the Portsmouth Park and Island Park area that addresses the bacteria contamination problems in the area. The TMDL study is entitled “FINAL Total Maximum Daily Load, The Sakonnet River –Portsmouth Park and The Cove – Island Park, March 2005. As part of the TMDL recommendations, the town of Portsmouth Wastewater Management Plan and the Wastewater Ordinance were passed by the Portsmouth Town Council in September 2015. Maintenance inspections of systems in the Island Park and Portsmouth Park areas are the town’s first priority in battling these issues, were due to be completed by July 1, 2017. Septic systems for the entire town are scheduled to be completed by 2022. In addition, all cesspools will be removed by 2025, with those within 50 feet of a storm drain removed by January 2020. Mandates from RI DEM and the recent effort by the town of Portsmouth via the Wastewater Management Plan will work to resolve these ongoing OWTS problems in the Portsmouth Park/Island Park areas. Until the town and property owners in these two areas have met the conditions of the NOV/Consent decree these areas will remain classified as prohibited. A complete vetting of the improvements will be performed prior to any reclassification of these two areas.

Figure 2: GA4 Wastewater Discharges, Marinas, and Pumpout Facilities



6.0 Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters as a source of shellfish for direct human consumption in order to maintain certification.

Water samples are collected at 21 monitoring stations throughout the growing area. Three of these stations are in prohibited areas, one is in a seasonally approved area in Sakonnet Harbor, and the remaining 17 are in the approved portions of the growing area.

Samples are collected 1-2 feet below the water surface (using 4-ounce sterile Nalgene bottles) after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics for GA4 were analyzed by the mTEC method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data is analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

HIGHLIGHTS

- * Sampled 6X during 2019 (2 wet weather, 4 dry weather).
- * Statistics represent recent 30 samples collected 4/16/2015 to 11/21/2019 during wet (n = 17) and dry (n = 13) weather for approved stations; all samples analyzed by mTEC method.
- * Statistics represent recent 15 samples (9 wet weather, 6 dry weather) collected 11/3/2015 to 11/21/2019 when seasonally approved station 4-11 (Sakonnet Harbor) was in the open status; all samples analyzed by mTEC method.
- * All approved and seasonally approved stations were in compliance and conformance.
- * Data run 12/16/2019.

COMMENTARY

The Sakonnet River (Growing Area 4) was sampled six times during 2019 which meets minimum systematic random sampling requirements for approved areas. The statistical evaluation of approved areas includes the recent 30 samples collected since 4/16/2015 during both wet (n=17) and dry (n=13) weather conditions. All approved stations are in program compliance and properly classified.

While all approved stations in GA4 are in compliance, two stations bear careful watch due to recent increases in fecal coliform values. The northern end of Nannaquaket Pond (station 4-4; south of Nannaquaket Bridge) had a third consecutive year of increased frequency of elevated fecal coliform observations. The 90th percentile variability criteria calculated for station 4-4 was 25.9 cfu/100 ml during 2019. While slightly improved since 2018, the 2019 result is close to exceeding the variability criteria threshold of 31 cfu/100 ml. Three of the recent 30 observations at this station were elevated, with all three of these elevated observations occurring one- to four-days after rain of 0.42" to 2.62". This station (station 4-4) is subject to freshwater input from nearby Sin and Flesh Brook which may be a source of elevated fecal coliform following rain. Station 4-21 located in the southern end of Nannaquaket Pond also saw increased

fecal coliform variability, with a 90th percentile increase from 10.6 cfu/100 ml in 2018 to 16.5 cfu/100 ml during 2019. Station 4-14, located off the mouth of Almy's Brook also displayed an increase in fecal coliform variability during 2019 due to four of the recent 30 observations being greater than 31 cfu/100 ml.

Classification of station 4-11 in Sakonnet Harbor was upgraded from prohibited to seasonally approved in 2016 due to improvements in water quality. The 2019 update indicated that seasonally approved station 4-11 was in compliance during the open season and that the area is properly classified.

RECOMMENDATIONS

- * Maintain Sakonnet Harbor (station 4-11) seasonal closure.
- * Investigate sources of recent increase in fecal coliform concentration at the northern end of Nanaquaket Pond (near station 4-4) and at station 4-14 (off Almy Brook) during wet weather.

RIDEM SHELLFISH GROWING AREA MONITORING: GA4

Recent 30, all weather

(4/16/2015 to 11/21/2019; all mTEC, 17 wet and 13 dry weather)

<u>Station Name</u>	<u>Status</u>	<u>N</u>	<u>FECAL-GEO</u>	
			<u>MEAN</u>	<u>90th Percentile (<31 cfu/100 ml)</u>
GA4-1	P	30	2.2	3.2
GA4-2	A	30	2.4	4.1
GA4-3	A	30	2.2	3.5
GA4-4	A	30	4.5	25.9
GA4-5	A	30	2.1	2.7
GA4-6	A	30	2.2	3.5
GA4-7	A	30	2.2	3.2
GA4-8	A	30	2.1	3.0
GA4-9	A	30	2.3	4.5
GA4-10	A	30	2.5	6.3
GA4-11	SA	30	2.6	6.4
GA4-12	A	30	2.2	4.1
GA4-13	A	30	2.2	4.2
GA4-14	A	30	3.7	16.1
GA4-15	A	30	2.2	3.4
GA4-16	A	30	2.1	3.4
GA4-17	A	30	2.1	3.2
GA4-18	A	30	2.1	2.8
GA4-19	P	30	2.3	4.2
GA4-20	P	30	2.7	7.3
GA4-21	A	30	3.8	16.5

Recent 15, when OPEN

(11/13/2015 to 11/21/2019; all mTEC, 10 wet and 5 dry weather)

<u>Station Name</u>	<u>Status</u>	<u>N</u>	<u>FECAL-GEO</u>	
			<u>MEAN</u>	<u>%>CRITICAL 31 cfu/100 ml</u>
GA4-11	SA	15	2.7	0.0

7.0 Conclusions and Recommendations

The results of this survey and the statistical evaluation of the growing area monitoring stations demonstrated that this growing area is properly classified. No changes in classification are recommended at this time.

Although meeting NSSP criteria, the Nannaquaket Pond area (stations 4-4 and 4-21) and the area near Almy's Brook (station 4-14) bear added scrutiny because of recent elevations in wet-weather fecal coliform levels.

An annual update for Sakonnet River is scheduled for 2020. The next 12-year sanitary shoreline survey is scheduled to be conducted in 2025.

Figure 3: 2019-2020 Shellfish Classification Map of GA 4 North

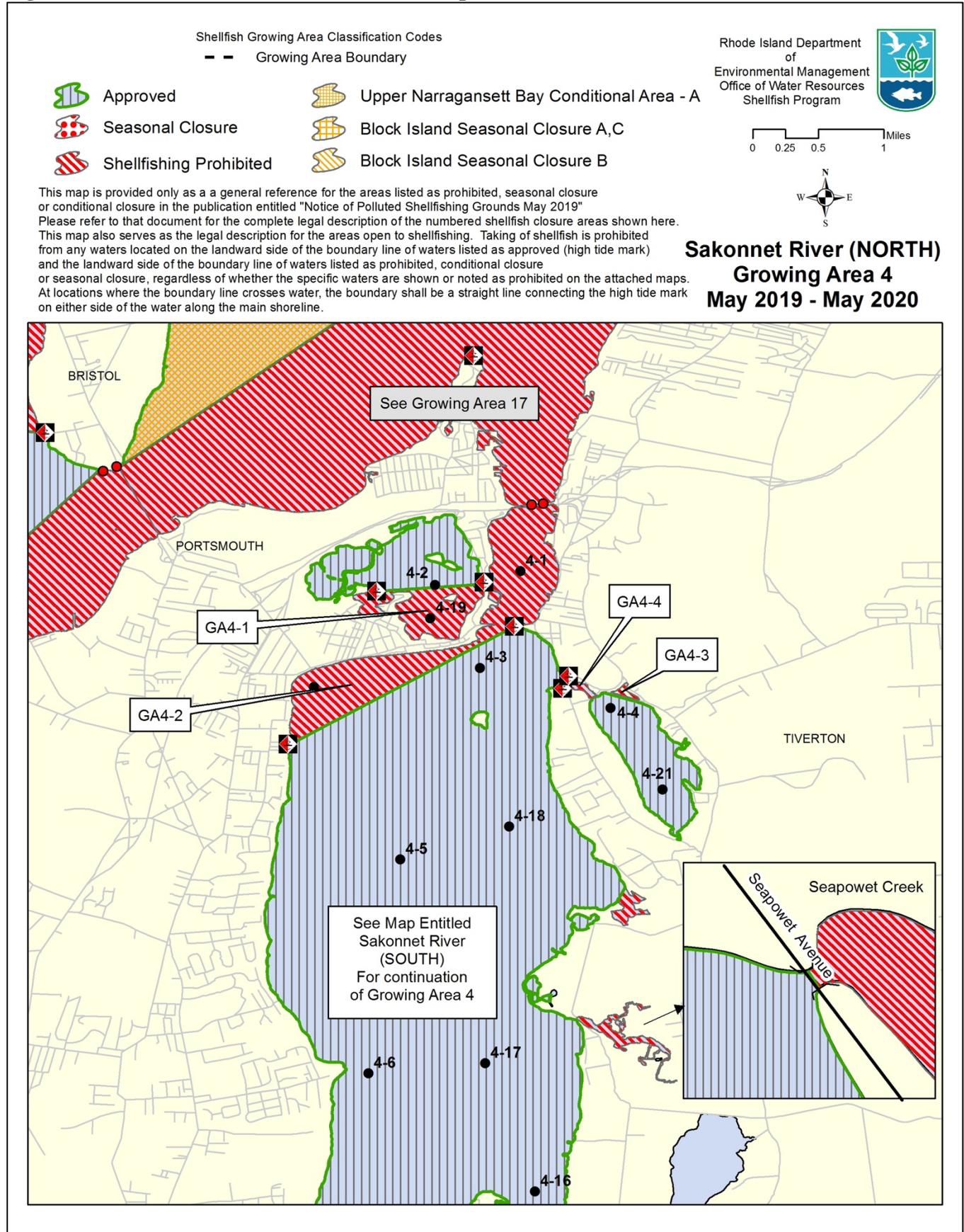
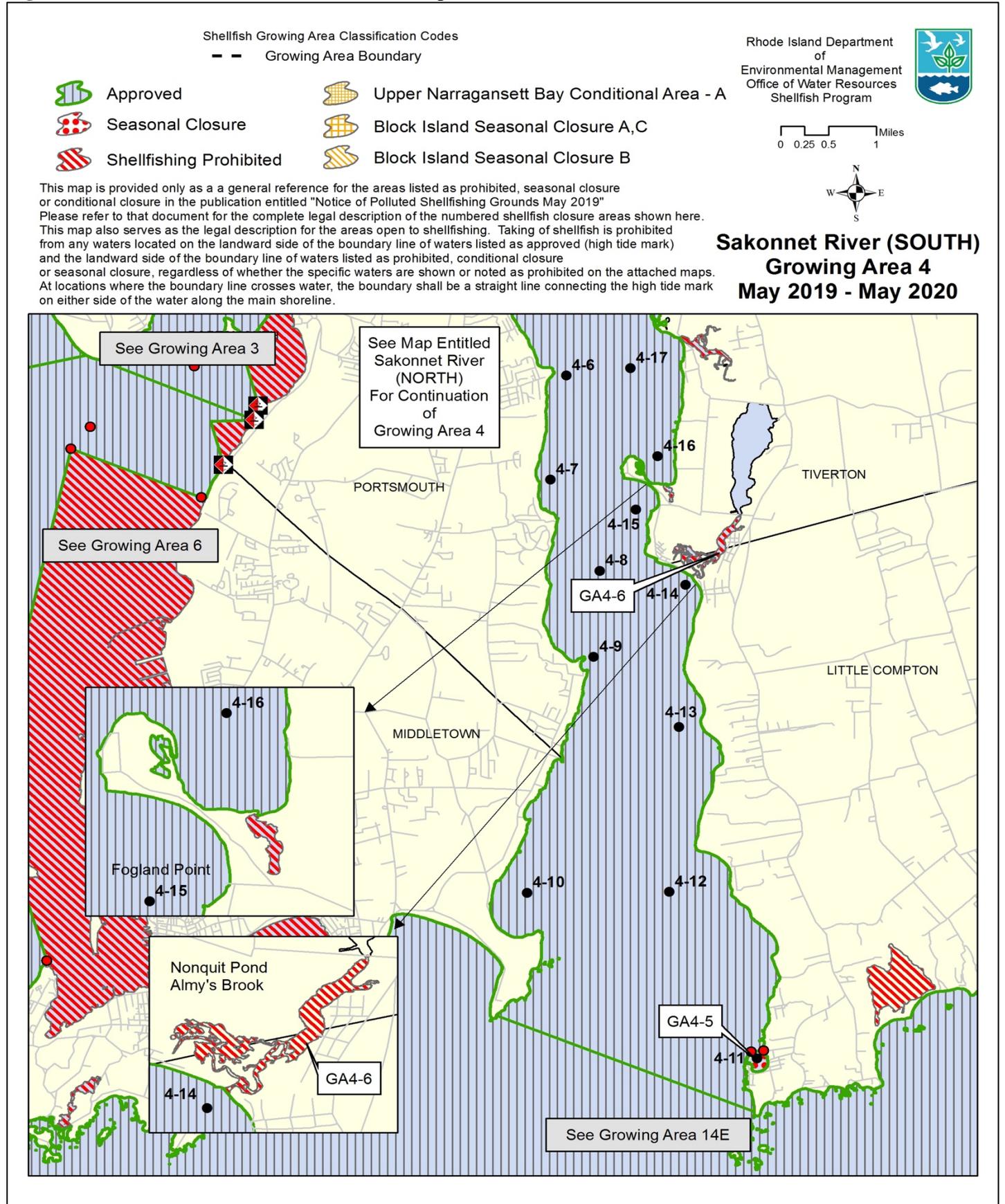


Figure 4: 2019-2020 Shellfish Classification Map of GA4 South



8.0 References

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GA 5 Kickemuit River Annual Update

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1. Introduction

Initial shoreline surveys of the Kickemuit River (GA5) were performed in 1994 and 1997. A 12-year comprehensive shoreline survey of the Kickemuit River (conditionally approved Growing Area 5) was conducted during the summer of 2008 by staff from RIDEM’s Office of Water Resources Shellfish Program. Triennial surveys of the area were completed in 2011, 2014 and 2017.

This report is a summary of the annual survey of this growing area which was completed in 2019. Follow-up sampling of all known GA5 pollution sources having previous observations of > 240 cfu/100 ml was completed as part of the 2019 annual update.

2. Pollution Source Survey

Two (2) sources were examined as part of the 2019 annual update. Source 5-013 (Figure 1) is a broken PVC pipe within the extension of the ROW of Chace Lane in Touisset. Originally identified as a groundwater seep, erosion has shown that this source is actually a broken pipe. Original sample results in 2015 had a result of 8,000 cfu/100ml. When sampled in 2018 Source 5-013 had a result of 720 cfu/100mL and when sampled in 2019 this source had a result of 100 cfu/100mL.



Figure 1: Source 5-013, a seep at the end of a right-of-way at extension of Chace Avenue.

The second source examined during the 2019 annual update was source 5-030 (Figure 2) which is an 18” corrugated metal pipe at the end of Smith Street in Warren, RI. This source was initially sampled on 10/17/2017 and had a high FC result of 2,900 CFU/100ml. The flow was only a slight trickle and the area the pipe discharges to was filled with debris. Because of the high bacteriological results, this source was resampled on 11/2/2017 with a result of <100 cfu/100 ml. 2018 follow-up sampling at source 5-030 on 10/16/2018 showed a fecal coliform level of > 1,600 cfu.100 ml. 2018 Shoreline source sampling was completed on 10/16/2018 while the conditionally approved GA5 was in the closed status. Sampling was done four days after 1.66” rain at the Taunton rain gauge. At this time source 5-030 was only a trickle and the source was not reaching the receiving waters of the Kickemuit River (GA5). In 2019 this source was also sampled with a result of 5,000 cfu/100mL, this source was not flowing and was considered “stagnant”. The source was not reaching the receiving waters. The limited impact of source 5-030 on the receiving waters of GA5 is evidenced by the fact that nearby GA5 shellfish monitoring station 5-4 which is ~500 feet east of source 5-030 was in compliance during 2019 with a geometric mean fecal coliform of 2.9 cfu/100 ml with 0% of samples exceeding 31 cfu/100 ml when the area was open to shellfish harvest.



Figure 2: Source 5-030, 18” corrugated metal pipe at the end of Smith Street, Warren, RI.

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted.

There were no indications that any of the sources identified during this survey have the potential to impact the conditionally approved waters of the Kickemuit River (Growing Area 5) due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

3. Marinas and Mooring Areas

The Kickemuit River growing area has one marina and several mooring fields as detailed in the shellfish program's document entitled "Evaluation of Waters Adjacent to Marinas – Marine Dilution Analysis Background June 2017". Waters adjacent to this marina have a seasonal closure (May to October) to be protective of shellfish waters should an accidental discharge from a vessel occur. All waters in Rhode Island are designated as No Discharge Zones which prohibits the discharge of any sewage from any vessel within any waters of the state. Information regarding the enforcement and inspection procedures for vessels operating in RI waters can be found on our website by following this link:
<http://www.dem.ri.gov/programs/water/shellfish/marine-pumpouts.php>

4. Waste Water Treatment Facilities

There are currently no wastewater treatment facilities that discharge directly to the Kickemuit River (GA5). This conditionally approved growing area is managed as a precipitation based growing area as outlined in the area's Conditional Area Management Plan (CAMP). As is the case of all areas that may have sewer systems or infrastructure within their watersheds a notification of any sewage overflow that may impact these waters could require an emergency closure. Such was the case when the town of Bristol's sewage pump station had an overflow that discharged into these waters. The River was closed immediately to the harvest of shellfish and remained closed until such time as the waters returned to approved status and sufficient time had elapsed for shellfish to self-cleanse in accordance with the model ordinance guidance or a minimum of 21 days. Records of this closure and subsequent actions are maintained in the program's central files.

A review of Onsite Wastewater Treatment System (OWTS) complaints and failures was conducted as part of the shoreline survey. There are currently no open complaints within 200ft of the Kickemuit River growing area. In February 2017, DEM investigated a complaint at 82 King Philip Ave in Bristol (on the western shoreline just south of Bristol Narrows) in which over time, the structure settled and the septic connection at the foundation separated from the discharge line, causing a chronic failure. The system was immediately reconnected to the septic system and a new septic pump installed as a short-term solution. The property has since been connected to the public sewer system and is no longer dependent on a OWTS.

In January 2018, a break in a sewer line caused by work on a water main in the general vicinity resulted in 265,000 gallons of untreated sewage to enter a stream and discharge into the conditionally approved Mt. Hope Bay (GA17) receiving waters just south of the Kickemuit River growing area. The discharge was discovered by town officials and DEM was notified immediately and the necessary repairs to the sewer line were made on January 25. The Kickemuit River growing area was closed throughout the overflow event due to its seasonal January closure. An extension to the closure was made until February 15 (resulting in a full 21-day closure from the end of the SSO event on January 24). The RI Department of Health verified that no shellfish product from these waters entered the market during the closure period.

Table 1: 2019 Summary of Pollution Sources in GA5

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2018 Results mTEC cfu/100ml	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
2019-5-030	7/2/2019	41.70351	-71.2489	18" CMP at end of Smith St. Stagnant pool of water. Does not reach receiving waters.	Conditional	A	I	NF	5000	NF
2019-5-013	7/2/2019	41.71089	-71.242	Groundwater stream at end of ROW	Conditional	A	D	720	100	0.0004

Highlighted sources >240 CFU/100ml NS = not sampled, NF = no flow, DNL = did not locate.

Figure 3: 2019 Pollution Sources in GA5 with Routine Monitoring Stations

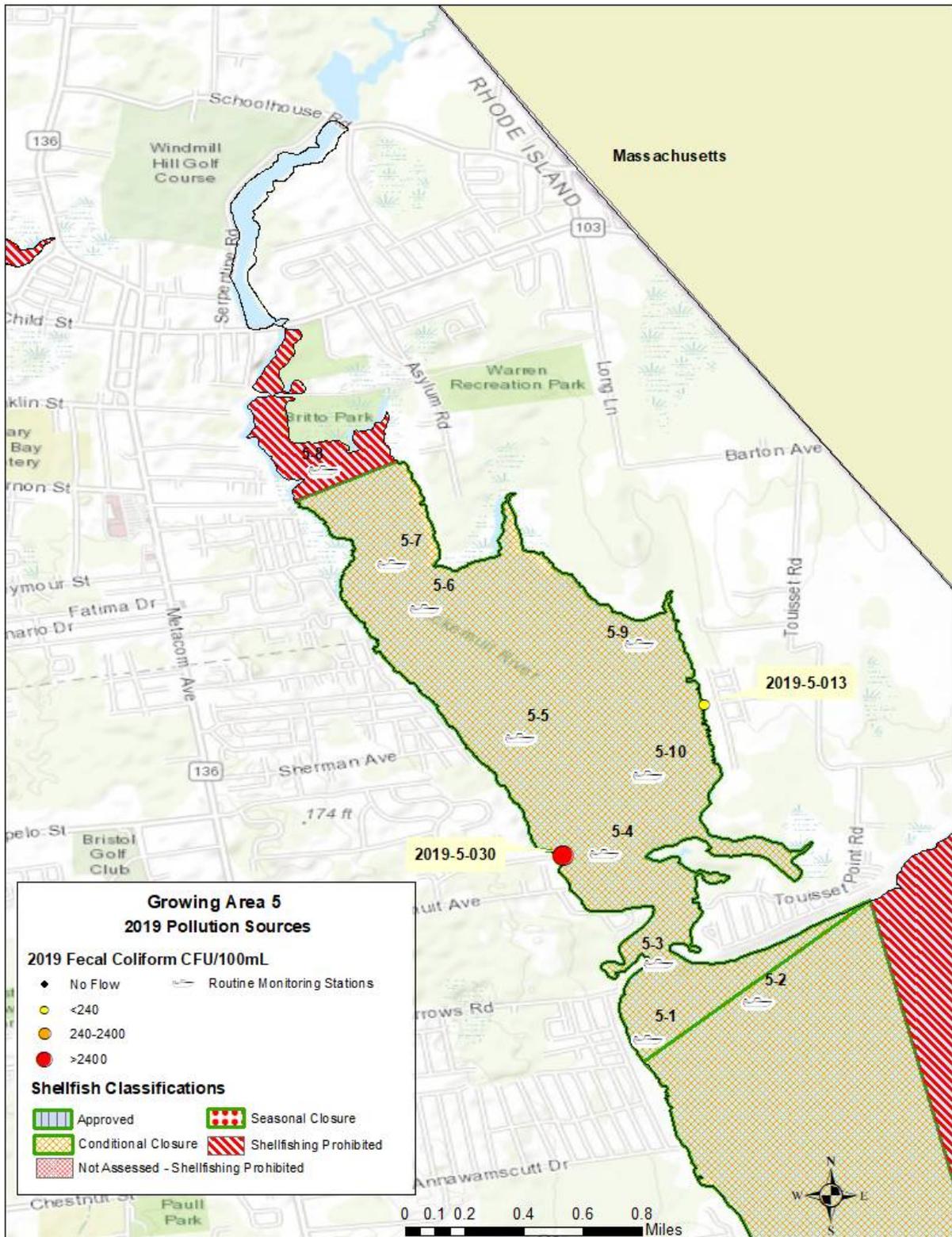
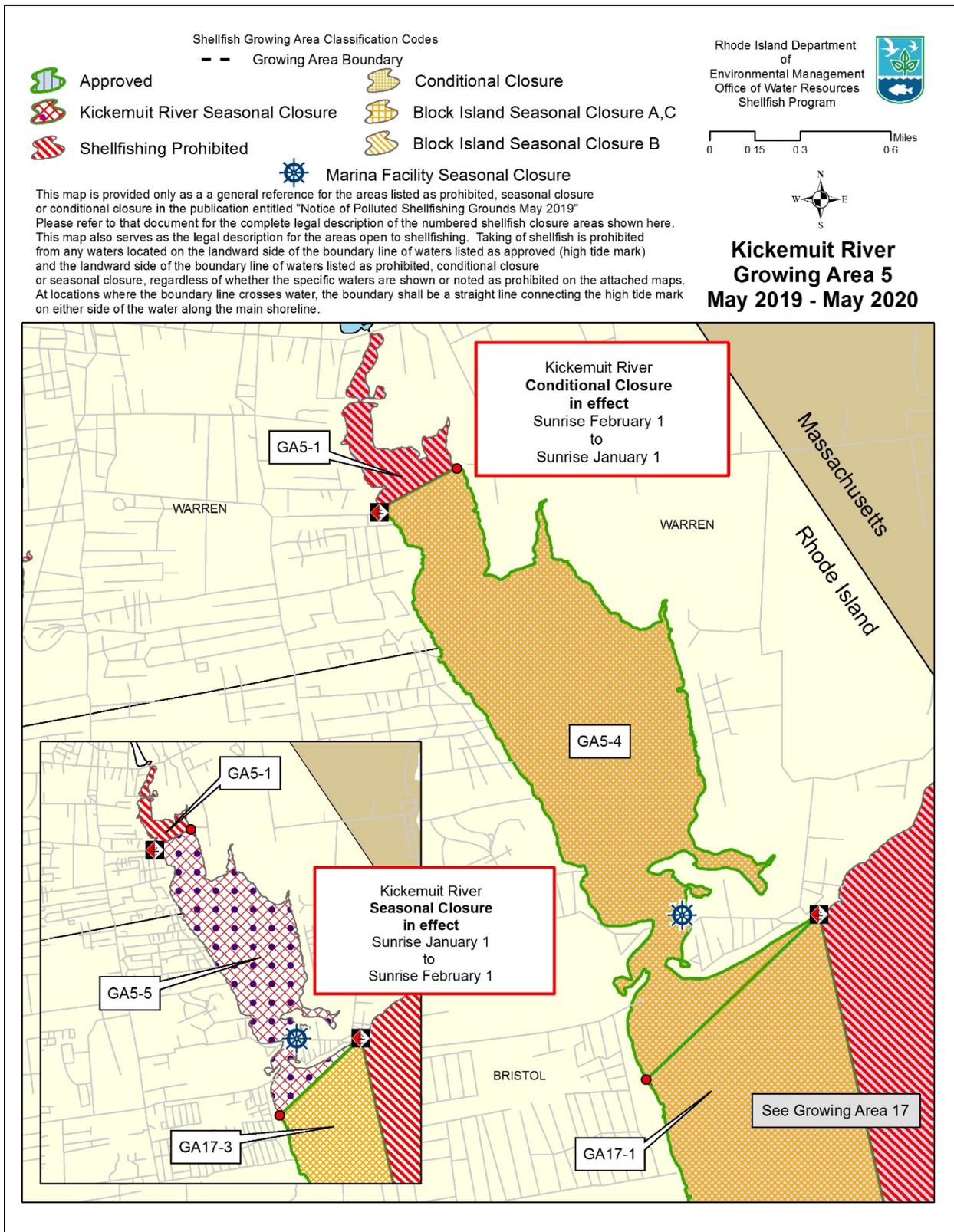


Figure 4: 2019-2020 Shellfish Classification Map of GA5



5. Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at ten (10) monitoring stations throughout the growing area. Nine (9) of the stations are in Conditionally Approved / Seasonally Approved waters and one (1) stations is located in prohibited waters.

Samples are collected 1-2 feet below the water surface (using 4-ounce sterile Nalgene bottles) after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics for GA4 were analyzed by the mTec method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data is analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 5

HIGHLIGHTS

- * Sampled 10X during 2019 season (9X during 2019, 1X during January 2020).
- * Statistics represent recent 15 dry-weather samples collected 3/20/2018 to 9/16/2019 when the Kickemuit conditional area was open.
- * All samples analyzed by the mTEC method.
- * All conditionally approved stations are in compliance and program conformance.
- * Data run 2/13/2020.

COMMENTARY

The conditionally approved Kickemuit River (Growing Area 5) was sampled nine times during 2019 and once during January 2020. 2019 season samples were collected eight times while the area was open for shellfish harvest and twice when the area was in the closed status (January seasonal closure). The Kickemuit has historically (since the 1980s) shown an increase in fecal coliform during winter months. A January seasonal closure was instituted for the Kickemuit River in 2016 due to elevated January fecal coliform readings which would result in exceedance of the NSSP fecal coliform variability criteria. Accordingly, January data are not included in the statistical analysis of recent 15 samples used for compliance with NSSP standards.

The 2019 statistical review demonstrated that all conditionally approved / seasonally approved (January closure) stations in the growing area are in program compliance. 2019 summary statistics were also calculated including January (seasonal closure) data for informational purposes. Inclusion of two sets of January samples (1/16/2019 and 1/8/2020) collected when the area was seasonally closed in the statistical summary resulted in all nine conditionally approved

stations meeting criteria. These 2019 results suggest that water quality during January may be improving, with acceptable fecal coliform water quality observed in January of 2018 and January of 2019. Monitoring during January should continue to evaluate the need for the seasonal (January) closure of GA5. The 2019 statistical review demonstrated that the Kickemuit River growing area is properly classified and that all conditionally approved stations are in program compliance.

RECOMMENDATIONS

- * Eliminate January seasonal closure of the Kickemuit River growing area.
- * Continue to sample the Kickemuit growing area during the January seasonal closure to track potential improvements in winter water quality.

Table 2 2019 Annual Statistical Results

RIDEM SHELLFISH GROWING AREA MONITORING: GA5

Recent 15 observations while the area is in the open status; all dry weather. Note that there are no January (seasonal closure) data in the recent 15 observations used for compliance. (3/20/2018 to 9/16/2019; all mTEC)

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA5-1	CA/SA	15	3.0	0.0
GA5-2	CA/SA	15	2.2	0.0
GA5-3	CA/SA	15	2.8	0.0
GA5-4	CA/SA	15	2.9	0.0
GA5-5	CA/SA	15	2.9	0.0
GA5-6	CA/SA	15	3.3	6.7
GA5-7	CA/SA	15	3.3	0.0
GA5-8	P	15	4.4	13.3
GA5-9	CA/SA	15	2.5	0.0
GA5-10	CA/SA	15	2.5	0.0

Recent 15 dry weather; **including January** (seasonal closure) data. Statistics calculated for informational purposes only, not for compliance. (5/15/2018 to 1/8/2020; all mTEC; includes 1/16/2019 and 1/8/2020 January data).

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA5-1	CA/SA	15	3.9	0.0
GA5-2	CA/SA	15	2.7	0.0
GA5-3	CA/SA	15	2.5	0.0
GA5-4	CA/SA	15	3.0	0.0
GA5-5	CA/SA	15	3.1	0.0
GA5-6	CA/SA	15	3.4	6.7
GA5-7	CA/SA	15	4.11	0.0
GA5-8	P	15	5.6	20.0
GA5-9	CA/SA	15	2.9	0.0
GA5-10	CA/SA	15	3.1	0.0

6. Conclusions and Recommendations

The 2019 annual update demonstrated that all monitoring stations in the growing area meet NSSP criteria while in the open status. The 2019 review also documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area. Recent January fecal coliform data are showing signs of improvement, but the January seasonal closure of the area should be maintained until a consistent pattern of acceptable January water quality is established.

A review of the current GA5 Management Plan was conducted to ensure compliance and accurate representation of current procedures related to the operation and management of GA5. This assessment indicated no significant deviations from the GA5 management plan. The sources identified and sampled as part of the 2019 annual update of GA5 indicated that the impact of the sources on the water quality of the Kickemuit River was minimal and that no changes in the growing area classification are recommended.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

Growing Area 6
East Passage of Narragansett Bay
2019 Annual Update

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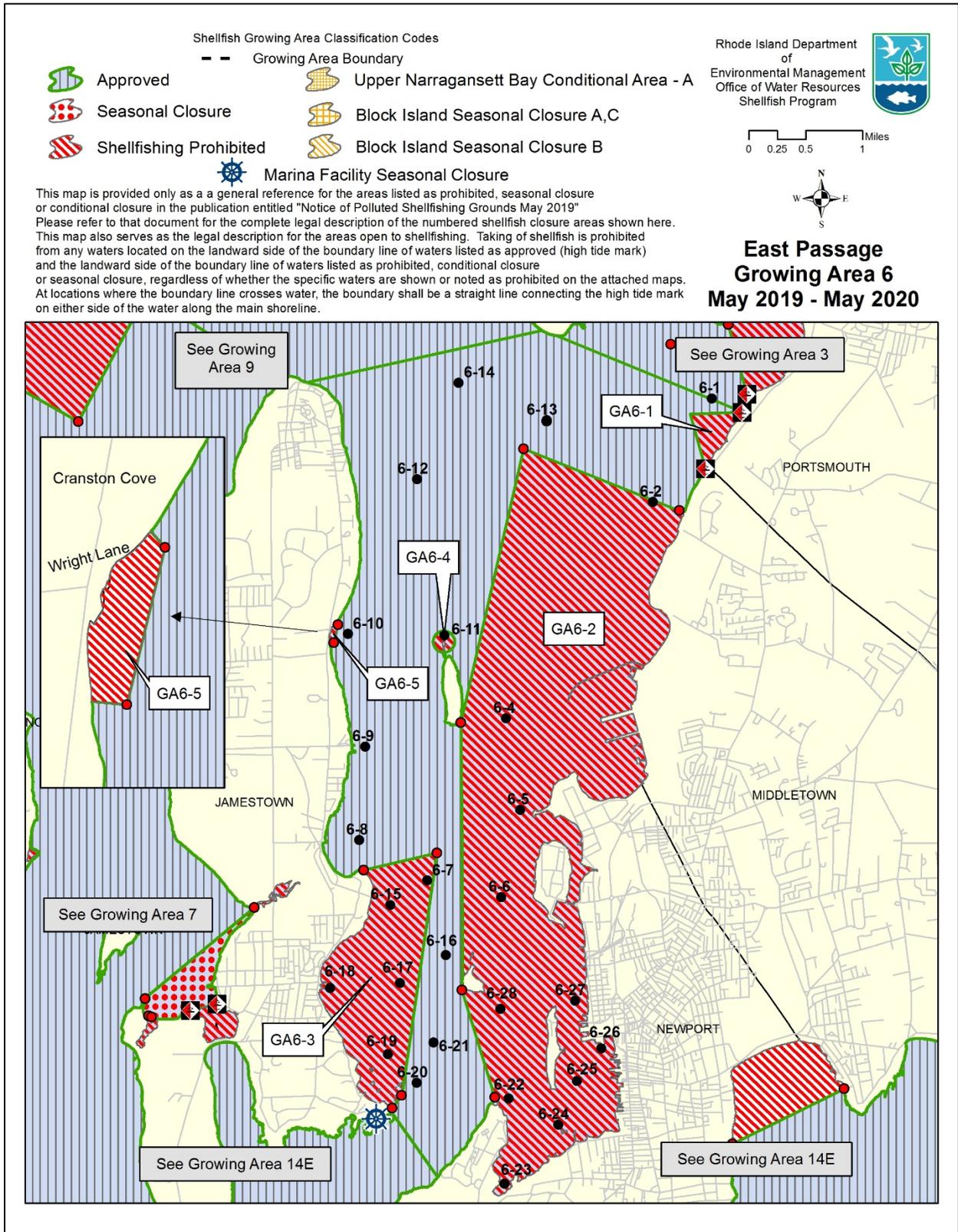
Table 1: GA6 Sources sampled during 2018	5
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1. Introduction

A twelve (12) year sanitary shoreline survey of the East Passage Growing Area 6 (Figure 1) was last conducted in 2015. Triennial surveys were completed in 2009, 2012 and 2018.

The 2015 12-year survey identified seventy-two (72) actual or potential sources. Fifty-four (54) of the sources were not actively flowing at the time of the shoreline survey with the remaining eighteen (18) having flows warranting sampling. In 2015 six (6) sources had bacteria counts greater than 2,400 cfu/100ml warranting follow-up sampling. Three (3) of those sources discharge to prohibited classification waters and were not re-sampled as part of the 2016 annual update. None of the three (3) sources requiring a follow-up were flowing during the 2016 annual update survey. Sources (6-001 and 6-003), which discharge into the Prohibited area near Cranston Cove in Jamestown (GA6-5 closure) were re-inspected in 2016. These two (2) sources showed no flow during 2016 which was a drier than normal year.

Figure 1: 2019-2020 Shellfish Classification Map of GA6 with Routine Monitoring Stations



In 2017 on October 3rd, a follow-up visit was made to ten (10) of the eighteen (18) sources that were measured during the 2015 twelve (12) year sanitary shoreline survey. The 2017 annual follow-ups were determined by bacteria sample results > 2400 cfu/100ml from the 2015 survey requiring a site visit during 2017 (Table 1). Of the ten (10) sources visited during the 2017 shoreline survey, eight (8) of them had no flow. The two (2) sources (2017-6-001 and 2017-6-500) with flow had bacterial levels < 2,400 cfu/100ml, which did not require additional follow-up sampling. Source 2017-6-001 has had historically elevated bacteria levels (higher than 2017 sample results) and has a small closure around the source, thus there is enough dilution area for the source before reaching approved growing waters.

2. Pollution Source Survey

No follow up source sampling was deemed necessary to complete the 2019 annual update because sources sampled during 2018 were either not flowing or had low results (Table 1). Of the six (6) sources that had bacteria results >2,400 CFU/100 mL during the 2015 12-year sanitary survey, three (3) were found to have no flow in 2018, and the remaining three (3) could not be located or no longer exist. As aforementioned those that were previously found to have been flowing had results well below the 2400 CFU/100 mL threshold (Table 1).

Table 1: GA6 Sources sampled during 2018

Source ID	Latitude	Longitude	Description and Location	Act/ Pot	Dir/ Indir	2015 Results	2017 Results	2018 Results	Volumetric Flow cfs	Date Visited/ Sampled
6-001	41.54162	-71.365	Stream north of Wright Lane	A	D	800	454	320	0.042	7/11/2018
6-001S			In stream	A	D			200		7/11/2018
6-003	41.54297	-71.3635	Stream thru woods	A	D	2700	NS	Could not find	NF	7/11/2018
6-102	41.53825	-71.3649	Small stream over rocks from uplands	A	D	1100	NS	NS	NF	
6-103	41.53822	-71.3649	Small stream maybe split of source #102 south of #102	A	D	800	NS	NS	NF	
6-106	41.53295	-71.3628	Very small stream from upland woods heavy iron bacteria	A	D	1430	NS	Could not find	NF	7/11/2018
6-107	41.53127	-71.3624	Small stream thru woods	A	D	662	0	Could not find	NF	
6-109	41.52988	-71.3621	Groundwater seepage fades out above tide line	A	I	685	NS	Could not find	NF	
6-209	41.51197	-71.3656	Outfall from retention pond at base of Newport Bridge can't	P	D	2600	0	NS	NF	7/11/2018
6-210	41.51173	-71.3653	Stone headwall w/ standing water most likely from retention	A	D	8000	0	NS	NF	7/11/2018
6-301	41.49587	-71.3667	24" dia CMP storm drain at corner of concrete seawall	P	D	7700	0	NS	NF	7/11/2018
6-311	41.49025	-71.3637	8" dia clay/iron pipe put in water took sample from drip	A	D	2120	NS	NS	NF	7/11/2018
6-500	41.48854	-71.363	24" Dia RCP before broken seawall	A	D	2400	99	DNE	NF	7/11/2018
6-500B	41.48506	-71.3606	24" RCP at private beach	A	D			DNE	NF	7/11/2018
6-505	41.49372	-71.3664	"Unknown source" for original description. Upon surveying, only visible potential source was an old broken iron pipe, half buried in sand. No evidence of recent flows.	A	D	4600	0	Could not find	NF	7/11/2018
6-606	41.52806	-71.3617	Multiple GW seeps	A	D	1720	NS	Could not find	NF	
6-850	41.56528	-71.3629	GW Seep @ brick abutment north of Broad St	P	D	300	NS	100	Stagnant	7/11/2018
6-852	41.56724	-71.363	Large stream north of Broad St	P	D	560	NS	60	0.021	7/11/2018
6-900			4" dia PVC pipe in cement seawall			10	NS	<2	Trickle	7/11/2018
6-901	41.49587	-71.3667	GW stream coming from base of rock wall below 6-301	A	D		NS	<2	0.042	7/11/2018

NS = no sample, DNE = does not exist / could not find

3. Marinas and Mooring Areas

There are thirty-five (35) marinas with more than 1,700 slips and moorings located within the waters of the East Passage growing area the majority of which are within the Newport and Jamestown harbor areas. All waters surrounding the marina proper are classified as prohibited with sufficient dilution in adjoining water to be protective of shellfish harvest.

Calculations to determine adequacy of this closure zone are contained in the program's permanent files in the report entitled "Evaluation of Waters Adjacent to Marinas: Marina Dilution Analysis Background, June 2017, RIDEM" and is available for review. Mooring areas were noted and where adjacent to existing marinas such as in Newport and Jamestown harbors they are included in the boat counts. Individual moorings were evaluated for their potential to impact approved shellfish waters

4. Waste Water Treatment Facilities

Public sewers service the majority of the Newport shoreline and a small portion of the Jamestown harbor area. All other areas of the watershed are serviced by onsite wastewater treatment systems (OWTSs). There are currently two municipal WWTFs that discharge to Growing Area 6: The City of Newport and the Town of Jamestown.

The review of the City of Newport's WWTF performance data report for 2019 indicates that there was a single TRC violation in July from the Washington St CSO, 30mg/L vs the permitted 20mg/L. The average flow from the treatment plant was 8.49 MGD well under the 16.0 MGD permitted level. The Newport WWTF is in the process of increasing their permitted flows by approximately 10% and will be completing major upgrades to their equipment. These upgrades include, new grit removal equipment, a new primary clarifier, reconfiguration of the aeration basins, larger chlorine contact tanks and other processing upgrades along with other system improvements to remove/reduce CSOs. The plant is under a judicial consent agreement to complete these improvements by 2019 with the CSO system work to be completed by 2032.

The Jamestown WWTF discharges to the waters of the East Passage (GA6) north of the Newport Bridge. A review of DMR data for the Town of Jamestown WWTF showed that there were two reported violations of monthly average flow during 2019. One violation in January of 0.77 MGD, and one in December of 0.84 MGD, both above the 0.73 MGD permit. The average monthly flow was 0.45MGD well within the permitted flow.

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of the East Passage due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

5. Water Quality Studies

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at twenty-seven (27) monitoring stations throughout the growing area. Ten (10) of the stations are in Approved waters and seventeen (17) stations are located in prohibited waters. The stations in prohibited waters are predominantly in the extensive marina and mooring areas of Newport Harbor and Jamestown Harbor. Samples are collected 1-2 feet below the water surface (using 4-ounce sterile Nalgene bottles) after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics for GA4 were analyzed by the mTec method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 6

HIGHLIGHTS

- * Sampled 6X during 2019 (3 wet weather, 3 dry weather).
- * Statistics represent recent 30 samples collected during wet (n = 13) and dry (n = 17) conditions during 4/1/2015 to 11/20/2019.
- * All samples analyzed by the mTEC method.
- * All approved stations are in compliance.
- * Data run 12/16/2019.

COMMENTARY

The East Passage (Growing Area 6) was sampled six times during 2019, complying with minimum systematic random sampling criteria. The recent 30 samples used in the evaluation were collected during both wet (greater than 0.5” rain during prior 7 days; n=13) and dry (n=17) weather conditions. All approved stations met NSSP criteria. In addition, 10 of 11 stations located in Newport Harbor which are classified as prohibited met criteria. This improvement in Newport Harbor fecal coliform water quality likely reflects recent CSO and stormwater control upgrades completed by the City of Newport. Results of the 2019 statistical evaluation indicate that all approved stations are in program compliance and that the area is properly classified.

RECOMMENDATIONS

- * Continue to collect and evaluate Newport Harbor fecal coliform data for potential reclassification of outer Newport Harbor.
- * No other recommendations based on the 2019 review of monitoring data.

RIDEM SHELLFISH GROWING AREA MONITORING: GA6
Recent 30 all weather.
(4/1/2015 to 11/20/2019; all mTEC, 13 wet and 17 dry weather)

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA6-1	A	30	2.3	4.2
GA6-2	P	30	2.2	4.3
GA6-4	P	30	2.3	5.9
GA6-5	P	30	2.4	5.2
GA6-6	P	30	2.2	3.5
GA6-7	P	30	2.2	3.6
GA6-8	A	30	2.0	2.4
GA6-9	A	30	2.2	3.5
GA6-10	A	30	2.1	2.9
GA6-11	P	30	2.2	3.7
GA6-12	A	30	2.3	4.4
GA6-13	A	30	2.2	3.6
GA6-14	A	30	2.0	2.0
GA6-15	P	30	2.3	4.9
GA6-16	A	30	2.3	5.1
GA6-17	P	30	2.0	2.4
GA6-18	P	30	2.1	3.7
GA6-19	P	30	2.2	4.2
GA6-20	A	30	2.2	3.8
GA6-21	A	30	2.1	2.6
GA6-22	P	30	2.7	6.4
GA6-23	P	30	2.6	5.4
GA6-24	P	30	3.2	11.6
GA6-25	P	30	4.5	19.2
GA6-26	P	30	7.0	37.8
GA6-27	P	30	2.7	7.3
GA6-28	P	30	2.1	2.8

6. Conclusions and Recommendations

The 2019 annual update demonstrated that all monitoring stations in the growing area meet NSSP criteria while in the open status. The 2019 review also documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area. Fecal coliform water quality in outer Newport Harbor has shown improvements in recent years, likely in response to upgrades in CSO and stormwater control made by the City of Newport. Continued monitoring will help to establish whether improvements in Newport Harbor water quality will continue to the point of a possible reclassification of outer Newport Harbor from prohibited to conditionally / seasonally approved.

Growing Area 6 (GA6) includes an extensive area that was formerly used by the US Navy as the headquarters for the US Atlantic Fleet Cruiser-Destroyer Force and the Naval Surface Group Four. This large military operation included a 6-mile stretch of shoreline and several thousand acres of facilities adjacent to GA6 extending from Newport to Portsmouth and the Gould Island portion of Jamestown. Naval activity in the area included fuel storage depots, training facilities and a torpedo production and testing facility on Gould Island. The US Navy torpedo production and other industrial facilities were largely decommissioned in 1973-74, but limited US Navy operations remain in the Newport-Middletown area.

RI DEM shellfish closure 6-2 (naval operations area in Newport and Middletown) and closure 6-4 (Gould Island) are in place to prohibit shellfish harvest in areas that may have nearshore sediments that were contaminated by the past naval-industrial operations. In 2018 and 2019 RI DEM received new data on the levels of metals, PAH and PCB contaminants in the sediments in nearshore waters surrounding the former torpedo production and testing facility at Gould Island. Sediments from the northeast corner of the island (near the former torpedo production facility) and from the west side of the island (former nearshore industrial incinerator ash disposal site) were shown to have metals, PAH and PCB levels that were similar to those found in marine sediments adjacent to industrial sites. Prior to 1980 a closure of waters within 500 feet of the shore of Gould Island was in effect. Limited data on the distribution of sediment metals, PAHs and PCBs and the depth contours around the island indicate that a similar 500 foot closure zone around Gould Island will be protective of public health. Accordingly, a change in classification for the nearshore waters within 500 feet of Gould Island to Prohibited is recommended. Simultaneous with the change in closure 6-4 (Gould Island), it is also recommended to modify the configuration of closure 6-2 (former naval operations area in Newport and Middletown). Moving the northwest boundary of closure 6-2 (formerly the day marker at Halfway Rock) southward to the northern end of the Gould Island torpedo testing pier will result in a reclassification of 559 acres at the northern edge of closure 6-2 from Prohibited to Approved. This southward shift in the northern boundary of closure 6-2 will result in a contiguous Prohibited zone encompassing the former naval-industrial operation on both the eastern (closure 6-2) and western (Gould Island, closure 6-4) portions of GA6. This recommended reconfiguration and reclassification will protect public health and will also be easier to demarcate and enforce.

**West Passage of Narragansett Bay
Growing Area 7
Triennial Re-Evaluation
2019**



Jamestown Bridge West Passage

Juan Carlos Cruz

**Rhode Island Department of Environmental Management
Office of Water Resources
Shellfish Monitoring Program**



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Introduction

A triennial re-evaluation shoreline survey of the West Passage of Narragansett Bay (Growing Area 7) was conducted in order to comply with National Shellfish Sanitation Program (NSSP) requirements for shellfish growing area classification. The primary objective of this shoreline survey is to identify and characterize sources of pollution affecting the area and re-evaluate point and non-point sources previously identified during prior surveys. Comprehensive 12-year shoreline surveys of the area were completed in 2005 and 2016. Triennial updates of the area were completed in 2008, 2011 and 2014. The 2019 report is a triennial re-valuation of the growing area.

This triennial update of Area 7 (Figure 1) was conducted during the summer and fall of 2019. The survey involved follow-up sampling of previously identified sources that resulted in fecal coliform counts exceeding 240 MPN / 100ml. These sources were evaluated to determine the bacteriological impact into the growing area. The survey area encompasses all the shoreline south of a line from Quonset Point in North Kingstown to Bonnet Shores in Narragansett and the western shoreline of Jamestown from Conanicut Point to Beavertail Point (Figure 1).

1.0 Description of Growing Area

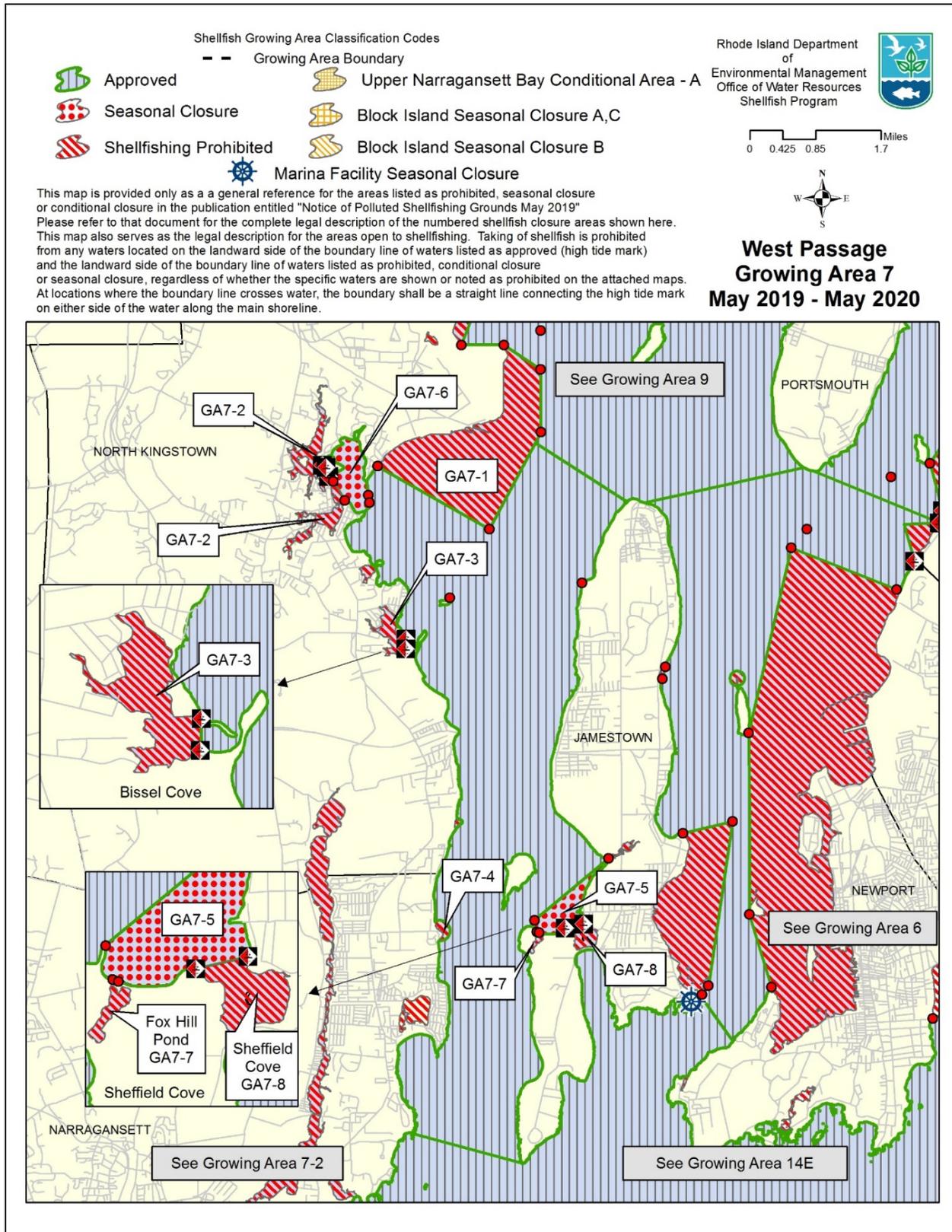
Growing Area 7 is presently comprised of sections classified as approved, seasonal, and prohibited for shellfishing (Figure 1). Five distinct areas of this growing area are prohibited to shellfishing. They are Wickford Cove, Bissel Cove, a portion of the upper West Passage abutting the Quonset Point area, Sheffield Cove in Jamestown, and the area around the docks at the University of Rhode Island's Bay Campus. Outer Wickford Harbor in N. Kingstown and Dutch Harbor on Jamestown are operated as conditionally approved / seasonally approved areas with seasonal closures in effect between Memorial Day weekend and Columbus Day weekend due to the large number of recreational boat facilities and transient moorings in these two areas during peak summer months. There are several aquaculture operations in the area south of Wickford Harbor (station 7-4) and on the west side of Jamestown (near station 7-7).

Hydrographic Characteristics

Total area of the West Passage Growing Area	7	Approximately 12,000 Acres
Widest Reach		Approximately 4.3 miles
Deepest Point		85 feet
Average Depth		30 -50 feet

The West Passage Growing area encompasses approximately 12,000 acres of relatively shallow Narragansett Bay waters. Much of the shoreline within the West Passage consists of medium to high-density developments with onsite waste water treatment systems (OWTSs). The southern portion of Jamestown and Dutch Island and the area near Rome Point are the only sections of the survey area that have large tracts of open space. There are four parks within this area consisting of Fort Getty Park (approx. 40 acres), Beaver Tail State Park (approx. 150 acres), Dutch Island (approx. 100 acres) and Rome Point (approx. 250 acres).

Figure 1: Current (2019-2020) Shellfish Classification Map GA7



2.0 Pollution Source Survey

Steven Rogers and Steven Engborg, Biologists from the Department of Environmental Management Division of Water Resources conducted the review for the triennial update of the shoreline of the West Passage. This review involved follow-up sampling on all previously identified sources in which bacterial results from sampling exceeded the 240 CFU/100 ml threshold established in the shellfish programs standard operating procedures. In 2019, eight sources warranted follow-up sampling. They are identified and described in Table 1. Figure 2 is a map depicting the location of these sources within the growing area.

Figure 2: 2019 Pollution Sources in GA7 with Routine Monitoring Stations

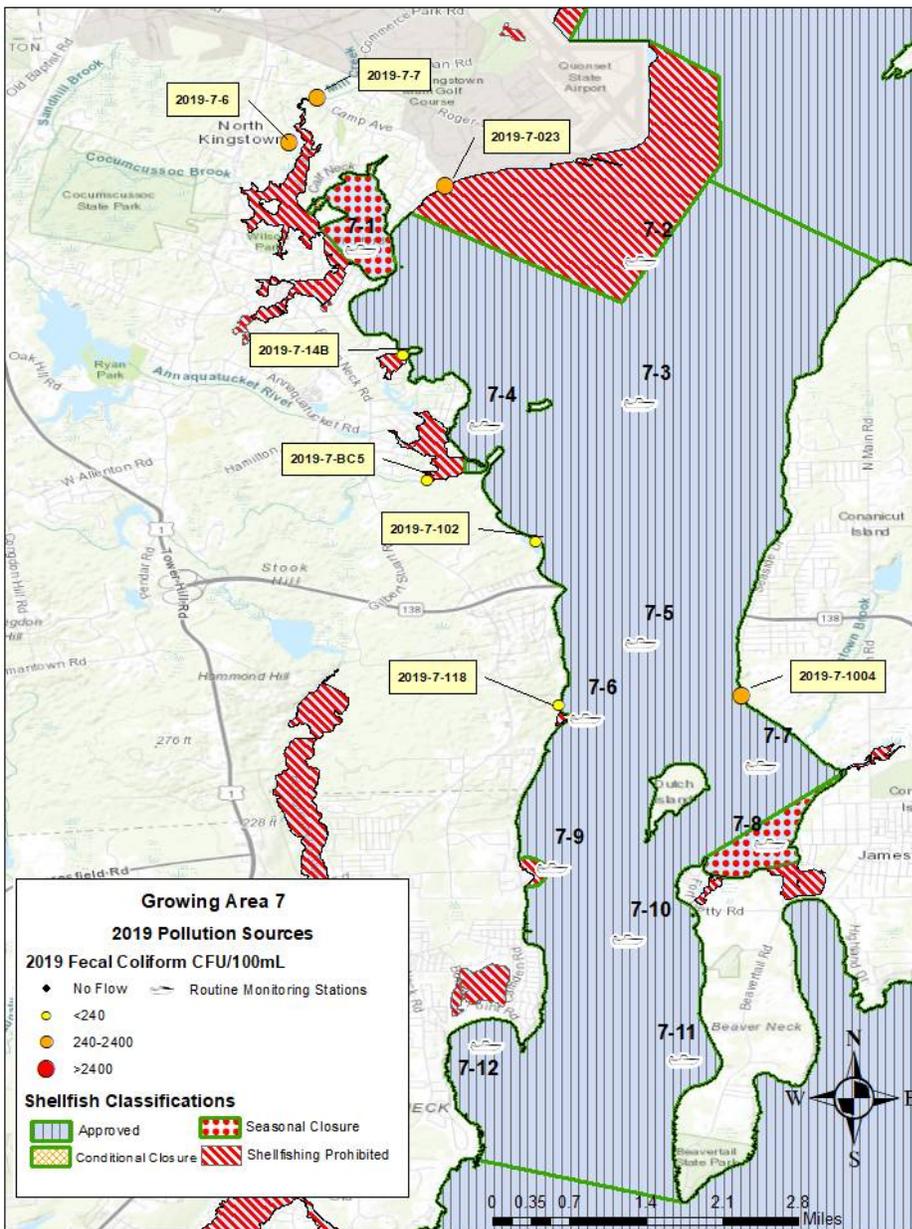


Table 1: 2019 Summary of Pollution Sources in GA7

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2018 Results mTEC cfu/100ml	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
2019-7-6	1-Jul	41.589	-71.45164	Stream at #15 Walnut Street	Prohibited	A	D	>1600	640	1.224
2019-7-7	1-Jul	41.595	-71.44799	Stream at Camp Ave Mill Creek Box culvert	Prohibited	A	D	>1600, 260	1100	3.366
2019-7-14B	1-Jul	41.5609	-71.4366	Outlet of Duck Cove	Approved	A	D	760, 54	36	218.571
2019-7-023	1-Jul	41.5832	-71.4311	Small outlet from upland marsh at north end of beach access from Shore Acres	Prohibited	A	D	>1600, 34	>1600	2.4188
2019-7-102	17-Jun	41.5362	-71.41897	Outlet from upland tidal pond - fades into sand above high tide	Approved	A	D	1500	9	0.68
2019-7-118	17-Jun	41.5145	-71.4159	2" pvc pipe	Approved	P	D	NF	9	0.000035
2019-7-1004	1-Jul	41.5158	-71.3917	Stream from wetlands and woods	Approved	A	D	760 in 2016	>1600	0.0015
2019-7-BC5	17-Jun	41.5443	-71.4334	Terre Mar Dr, SW Bissel Cove. Stream into cove	Prohibited	A	D	620 in 2016	50	5.61

Highlighted sources >240 CFU/100ml

IS = In stream sample NS = Not sampled NF = No flow CNL = Could not locate

Sources 7-6 and 7-7 are both small streams that flow into the receiving waters of Mill Cove (classified as Prohibited) in inner Wickford Harbor, North Kingstown, RI. Source 7-6 is a stream near #15 Walnut Street that flows into the prohibited waters of Mill Cove in the northwest corner of inner Wickford Harbor. This source (7-6) had a fecal coliform concentration of 640 cfu/100 ml sampled on July 1, 2019. This freshwater stream enters prohibited waters approximately 1.2 miles inland of the seasonally approved waters of outer Wickford Harbor. Source 7-7 had a fecal coliform concentration of 1,100 cfu/100 ml on 1 July 2019. The distance (1.2 to 1.5 miles) from these sources through a prohibited zone to the seasonally approved waters of outer Wickford Harbor provides sufficient dilution to reduce bacteria levels prior to reaching shellfish harvest waters. This is supported by results at DEM Shellfish monitoring station 7-1, located in seasonally approved waters of outer Wickford Harbor which had a fecal coliform geometric mean of 2.7 cfu/100 ml with 0% of the recent 15 observations exceeding 31 cfu/100 ml while the area was in the open (seasonal) status for shellfish harvest.

Source 7-023 is a small stream that flows from an upland marsh across a beach in the Shore Acres area of North Kingstown. This source had a fecal coliform result of >1,600 cfu/100 ml, when sampled for the 2019 sanitary survey (7/1/2019). The small stream enters a prohibited safety zone around Quonset Point which provides a sufficient dilution buffer between the source and the approved waters of GA7.

Source 2019-7-1004 is a stream from an uphill wooded wetland on Jamestown Island. This is the only source that flows into the approved waters of the West Passage. In 2016 this source yielded bacteria results of 760 CFU/100 ml, and in the 2019 survey it yielded bacteria results of >1,600 CFU/ 100 ml. The flow rate at the time of this sample was 0.0015 cfs (Table 1). Given the minimal flow, bacteria from this source are rapidly diluted and are not expected to impact the growing area. This source will be closely monitored moving forward.

Figure 3: Source 2019-7-1004



In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Growing Area 7 (West Passage) due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

3.0 Wastewater Treatment Facilities (WWTF)

Public sewers service several areas adjacent to the growing areas of the West Passage including the Bonnet Shores neighborhood of Narragansett, east of the Narrow River and a 752-acre area just east of Dutch Harbor and Sheffield Cove in Jamestown. These areas are serviced by WWTF that discharge outside growing area 7. The area surrounding Quonset Point is also serviced by municipal sewers and a WWTF that discharges into a closed safety zone (prohibited area) in Growing Area 9. All other areas of the watershed are serviced by Onsite Wastewater Treatment Systems (OWTS). There are currently seven RIPDES permits that discharge into the growing area. Four are part of the University of Rhode Island and EPA facility located at the URI Bay Campus on Ferry Road in Narragansett. Currently a radial prohibited safety zone is in place around these discharges. Routine monitoring station 7-9 is a sentinel station located just outside of this closed safety zone and results from the most recent thirty samples indicate that these waters were well below NSSP standards for approved waters during 2019 (station 7-9 had a geometric mean of 2.0 cfu/100 ml and a 90th percentile of 2.4 cfu/100 ml for 2019; refer to Table 2 for the 2019 statistical summary).

Two RIPDES permitted discharges are in the Quonset Point/Davisville area. One is a non-sanitary water release pipe from the V & G Sea products facility and the other is a major sanitary discharge pipe from the RI Economic Development's Wastewater Treatment Plant. The Quonset WWTF discharges treated effluent into waters of Growing Area 9, just north of GA7. A review of Quonset Point WWTF performance data (echo.epa.gov) indicates that there were no fecal coliform violations during 2019. Per NSSP Model Ordinance requirements a prohibited safety zone is established around this outfall. The PLUMES model analysis used to establish the size of the closed safety zone is available for review in the program's permanent files.

The final RIPDES permitted discharge is a non-sanitary water release pipe from the Jamestown Water Treatment Facility that discharges into Jamestown Brook which then ultimately discharges into the east shore of Jamestown at the northern end of Dutch Island Harbor. This discharge (identified as source 7-1000) has historically had low fecal coliform values (2018 result was below detection of 2.0 cfu/100 ml) and the source has little impact on the receiving waters.

4.0 Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at thirteen (13) monitoring stations throughout the growing area. Two (2) of the stations are in Conditionally Approved / Seasonally Approved waters and three (3) stations are in Prohibited waters. The remaining eight (8) stations are in Approved waters.

Samples are collected 1-2 feet below the water surface (using 4-ounce sterile Nalgene bottles) after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics for GA4 were analyzed by the mTEC method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 7

HIGHLIGHTS

- * Sampled 6X during the 2019 season (5X during 2019 and 1X in January 2020).
- * For approved stations, statistics represent recent 30 samples collected during wet (n = 16) and dry (n = 14) conditions during 9/6/2015 to 1/7/2020.
- * For seasonally approved stations 7-1 and 7-8, statistics represent recent 15 samples collected 12/9/2015 to 1/7/2020 when these seasonally approved stations were open.
- * All approved stations are in compliance.
- * All seasonally approved stations are in compliance.
- * All samples analyzed by the mTEC method.
- * Data run 2/12/2020.

COMMENTARY

The West Passage (Growing Area 7) was sampled five times during 2019 and once during January 2020 with three wet weather and three dry weather samples collected during the 2019 season. The recent 30 samples used in the 2019 statistical evaluation of approved stations were collected since 9/16/2015 and included samples collected during wet (n=16) and dry (n=14) weather conditions. Statistics for seasonally approved stations 7-1 and 7-8 were calculated based on the recent 15 samples (9 wet, 6 dry) collected when the station was in the open status.

Results of the 2019 statistical evaluation demonstrated that all approved stations are in program compliance. 2019 compliance statistics for seasonally approved stations 7-1 (Wickford Harbor) and 7-8 (Sheffield Cove) also demonstrated that these stations are in compliance and that the seasonal closures

in these areas are effective. A new station (station 7-1A) was added to the prohibited area in Mill Cove (inner Wickford Harbor) to assess the water quality further in Mill Cove and the impacts of the streams flowing into the cove.

RECOMMENDATIONS

- * No actions required based on 2019 ambient monitoring results.
- * Continue monitoring station 7-1A to track water quality changes in inner Wickford Harbor

RIDEM SHELLFISH GROWING AREA MONITORING: GA7

Recent 30 all weather.

(9/16/2015 to 1/7/2020, all mTEC, 16 wet and 14 dry weather)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA7-1	SA	30	3.5	13.3
GA7-1A**	P	10	18.9	122.5
GA7-2	P	30	2.0	2.4
GA7-3	A	30	2.3	5.2
GA7-4	A	30	2.8	7.6
GA7-5	A	30	2.2	3.4
GA7-6	A	30	2.0	2.0
GA7-7	A	30	2.0	2.0
GA7-8	SA	30	2.0	2.0
GA7-9	P	30	2.0	2.4
GA7-10	A	30	2.0	2.7
GA7-11	A	30	2.0	2.0
GA7-12	A	30	2.1	3.0

** new station 7-1A added for Mill Cove, Wickford Harbor in 2018; number of observations is low (n=10) and insufficient data to calculate representative statistics for compliance.

Recent 15, when OPEN

(12/9/2015 to 1/7/2020, all mTEC, 9 wet and 6 dry weather)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA7-1	SA	15	2.7	0.0
GA7-8	SA	15	1.9	0.0

5.0 Conclusions and Recommendations

The 2019 triennial update of Growing Area 7 (West Passage of Narragansett Bay) demonstrated that all Approved and Conditionally / Seasonally Approved monitoring stations in the growing area meet NSSP criteria while in the open status. The 2019 review also documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

GA 7-2 Annual Update: Narrow (Pettaquamscutt) River

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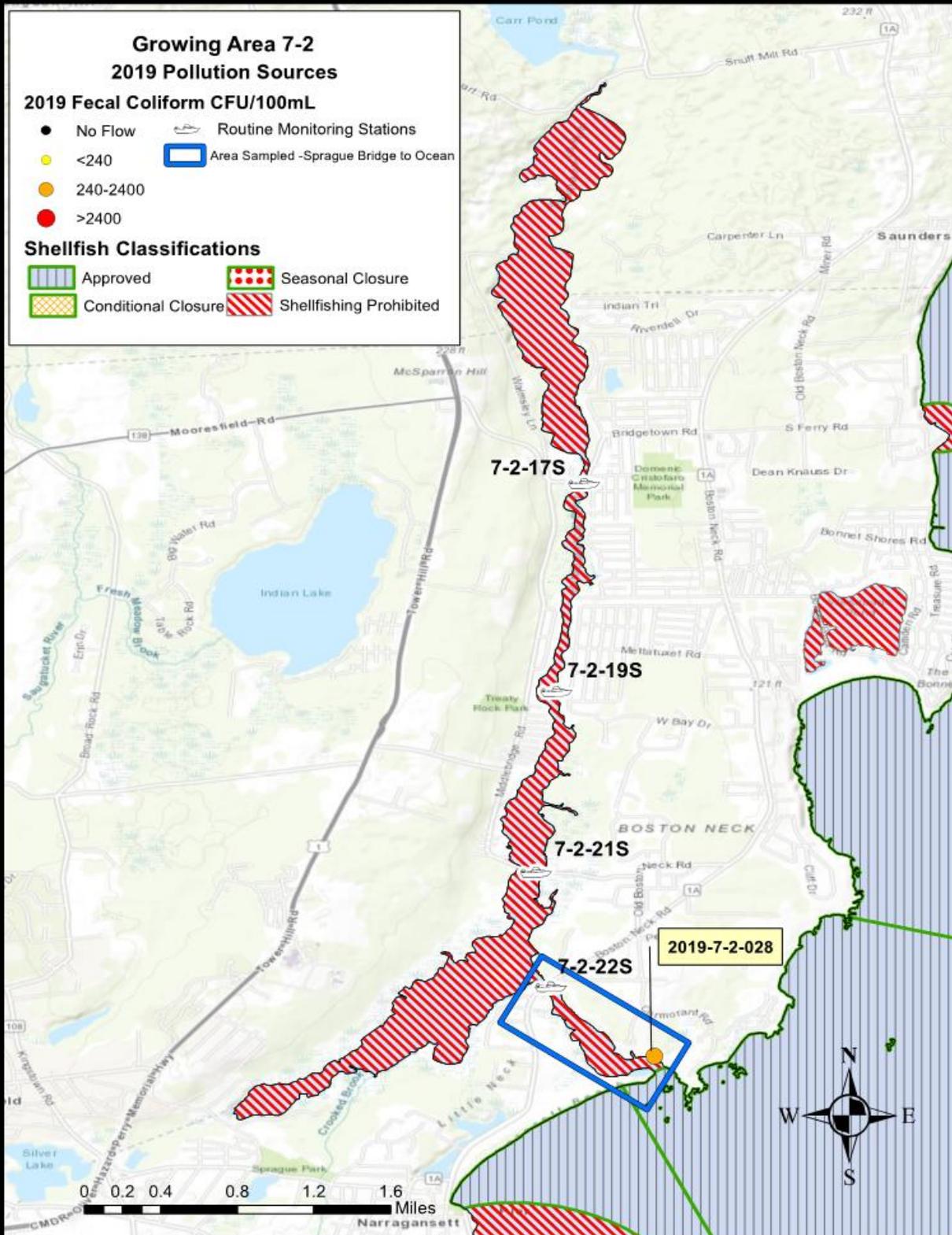
1. Introduction

All waters of the Narrow River, Growing Area 7-2 have been classified as prohibited to shellfishing since August 28, 1979 due to elevated fecal coliform concentration. Because the area has been classified as prohibited to shellfishing for decades, a shoreline survey of the growing area has not been completed since 1979. However, during July 2018 DEM Shellfish staff completed a comprehensive shoreline survey of the southernmost section of GA7-2, the area south of Sprague Bridge to the confluence of the Narrow River with the open waters of Rhode Island Sound (GA14). In addition, DEM Shellfish staff regularly sample four stations in the Narrow River to track changes in fecal coliform concentration. Follow up sampling was completed in July of 2019.

2. 2019 Shoreline Survey of Lower River

A shoreline survey of the southernmost portion of the Narrow River (GA 7-2) was completed on July 1st, 2019 by DEM Shellfish staff. The area surveyed is approximately 4,500 feet of tidal river length extending from the crossing of Route 1 at Sprague Bridge south to where the Narrow River joins RI Sound (Figure 1). The area surveyed comprises approximately 39 acres of Narrow River tidal waters currently classified as prohibited to shellfish harvest. The area is a popular recreational site visited by small boats (kayaks, skiffs) during the warmer months of the year. The tidal waters are surrounded by a fringing *Spartina*-dominated saltmarsh and upland forest with some residential housing. There are approximately twenty (20) private residences and two (2) beach clubs within 1,500 feet of the surveyed area of the Narrow River. Results of the 2019 follow up sampling are in Table 1.

Figure 1: Site examined during shoreline survey of the lower Narrow River (GA7-2) during 2019



Twenty-seven (27) potential sources were identified with seven (7) sources found to be dry during the 2018 survey. No large-flow sources were identified, with most potential sources having only a trickle of flow on the survey dates. Nineteen (19) of the twenty (20) sources found to have some flow, had fecal coliform results of less than 240 cfu/100 ml. Source 2019-7-2-028 was the only source resampled in 2019.

Source 7-2-028 is a small seep (approximately 1 foot wide by 1 inch deep) flowing from an upland *Phragmites* spp. stand and across a small beach. On 7/1/2019, this seep had a flow of 0.0769 cfs and a fecal coliform concentration of 580 cfu/100 ml was observed at the location where the seep exits the *Phragmites* stand. Because of the low flow, source 7-2-028 presents little potential for negatively impacting the bacteriological quality of Growing Area 7-2 or adjacent Growing Area 14. Source 7-2-028 will be monitored with follow-up sampling.

Figure 2: Source 7-2-028 a small seep flowing out of uplands, through a *Phragmites* stand. Photo taken 7/1/2019.



Table 1: GA 7-2 sources exceeding 240 cfu/100 ml.

Source ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Description and Location	Receiving Waters Classification	Act / Pot	Dir/ Indir	Results	Flow (cfs)	Source Dimensions
2019-7-2-028	41.44351	-71.441625	GW stream, through phragmites, flows across sand beach into receiving waters	Prohibited	A	D	581	0.077	2 ft wide by 1 inch deep

3. Water Quality Monitoring

The Shellfish Growing Area Monitoring program is part of the state of Rhode Island's agreement with the United States Food and Drug Administration's National Shellfish Sanitation Program (NSSP). The purpose of this program is to maintain national health standards by regulating the interstate shellfish industry. As part of this agreement, the state of Rhode Island is required to conduct continuous bacteriological monitoring of the shellfish harvesting waters of the state in order to maintain certification of these waters for shellfish harvesting for direct human consumption.

Surface water samples are collected by the RIDEM OWR Shellfish Program staff. A description of field conditions is recorded, which includes overall tidal stage, wind direction and speed, number of days since last rain and the rainfall total, the status of conditional areas (open or closed), any important observations such as flocks of birds or algae blooms, and water temperature and collection time at each sampling station. All samples are analyzed by the RIDOH Water Microbiology Laboratory for the presence of fecal coliform bacteria. RIDOH uses the procedures as prescribed by the American Public Health Association in "Standard Methods for the Examination of Water and Wastewater" (APHA, 1995) for the standard fecal coliform membrane filtration method (sm48 mTEC) utilized exclusively since August 2012 and/or the multiple tube fermentation test (sm01 MPN) method utilized prior to August 2012. Results from the different analytical methods are being co-mingled and statistical analysis is being performed according to the "SOP MPN to mTEC Transition" document dated August 2012 (RIDEM, 2012). The procedure for water sample holding times and temperature control for the sm48 and sm01 methods are described in the RI DEM Shellfish Growing Area Monitoring Program Standard Operating Procedures (copy in the Program's permanent file).

The results of all bacteriological monitoring – whether collected as part of the routine bacteriological monitoring program or sanitary survey program – are evaluated by RIDEM Shellfish staff as they are received from the RIDOH. Any unusual or exceptionally elevated values are immediately evaluated to determine the need for additional sampling and/or investigation

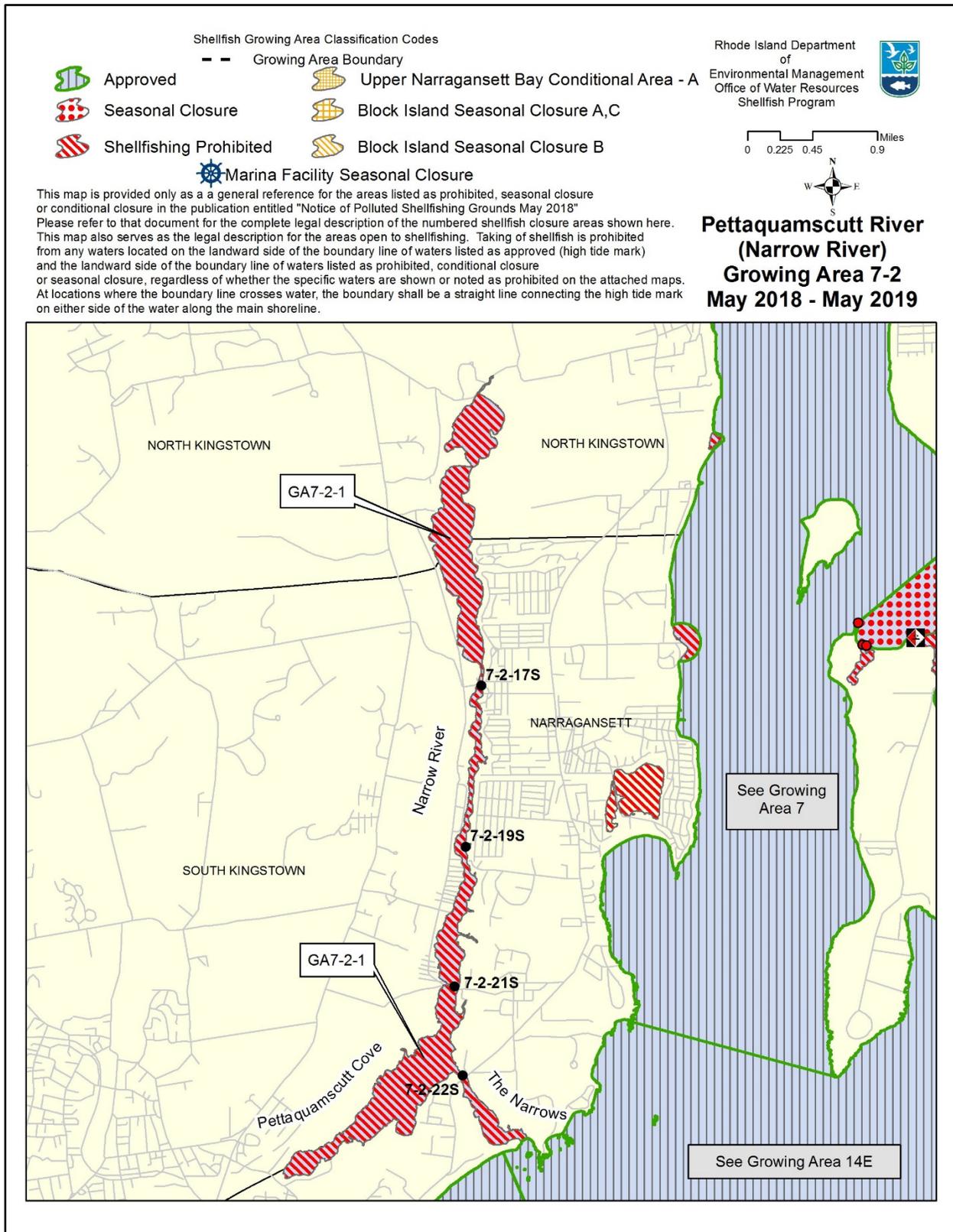
The waters of the Narrow River were sampled six (6) times during 2019. Four (4) shore stations (stations 7-2-17S, 7-2-19S, 7-2-21S and 7-2-22s; Figure 1) were sampled under a variety of conditions in support of potential re-classification. The attached GA7-2 map, Figure 3 shows the sampling station locations and the current classification of this growing area. Results from the statistical evaluation demonstrated that all four stations exceed shellfish standards under an approved scenario (recent 30 samples under all weather conditions, 12 wet weather and 18 dry weather). In addition, all of the stations north of Mettataxet (stations 7-2-17S, 7-2-19S and 7-2-21S) did not meet shellfish standards under a conditionally approved scenario (recent 15 samples collected during dry weather of < 0.5" rain in 7 days prior to sample). However, under the conditionally approved scenario with a 0.5" or greater rainfall closure, station 7-2-22S located just south of Sprague Bridge did meet statistical criteria for the harvest of shellfish, indicating initial support of a conditionally approved area with a closure criteria during wet weather of less than 0.5" of rain. Continued monitoring of wet weather conditions must be conducted to determine whether station 7-2-22S would reliably stay within compliance under 0.5" of rain. In addition, the establishment of recovery times associated with this management criteria and an evaluation of the program's logistical ability to support monitoring of this area would need to be completed if an upgrade to conditionally approved classification was warranted

4. Marinas and Mooring Fields

There are two marinas located within the waters of this growing area. Both marinas have limited capacity in that the waters of the river are fairly shallow, which limits the size of boat capable of navigating to these marinas. However, the waters of the entire river are currently classified as prohibited

which includes the marina proper and further provide more than ample dilution to be protective of shellfishing in adjacent approved waters at the confluence of the river with open waters of Rhode Island Sound approximately a mile and a half to the southeast. Refer to the report entitled RIDEM “Evaluation of Waters Adjacent to Marinas: Marina Dilution Analysis Background, June 2017” which is located in the program’s permanent files for further details and the relative dilution calculations.

Figure 3: 2018-2019 classification map and routine monitoring stations.



5. Annual Statistical Summary

GROWING AREA 7-2 - PETTAQUAMSCUTT RIVER (Narrow River)

HIGHLIGHTS

- * Sampled 6X during 2019.
- * Shellfishing is prohibited in growing area 7-2. Statistics were calculated for informational purposes of tracking water quality changes.
- * Statistics represent recent 30 samples collected during wet (n= 12) and dry (n= 18) weather 8/10/2016 to 8/26/2019.
- * Statistics also calculated under dry weather scenario (less than 0.5” rain in prior 7 days) for recent 15 samples collected 11/22/2016 to 8/26/2019.
- * All samples analyzed by the mTEC method.
- * Data run 12/17/2019.

COMMENTARY

The Narrow River also called the Pettaquamscutt River (Growing Area 7-2) was sampled 6 times from shore-access stations during 2019. The area is classified as prohibited to shellfishing so there is no minimum sampling requirement. The 2019 statistical evaluation for the Pettaquamscutt River includes a conditionally approved scenario (recent 15 samples collected during dry weather) and an approved scenario (recent 30 samples collected under all weather conditions). The area has been closed to shellfish harvest for direct human consumption since 1985 due to unpredictable and elevated fecal coliform levels. A TMDL was completed for the area in 2002, with recommendations for monitoring to follow long-term changes in fecal coliform water quality.

There are no NSSP guidelines for statistical evaluation of prohibited areas. Summary statistics for this growing area were calculated to track changes in water quality, not for compliance. Based on the recent 30 samples, all stations in the Narrow River exceeded criteria for approved waters. Evaluating the recent 15 samples under a conditionally approved 0.5” rain closure management scenario of a 7-day closure following >0.5” rain, all stations north of Mettatuxet (stations 7-2-17S, 7-2-19S and 7-2-21S) exceed fecal coliform criteria. Under this conditionally approved scenario, station 22S, south of Sprague Bridge near the connection of the Narrow River with Rhode Island Sound, would meet water quality criteria for conditionally approved areas. Further monitoring is required to ascertain whether these recent improvements in lower Narrow River water quality are predictable and persistent enough to support a change in classification.

RECOMMENDATIONS

- * Continue approximately monthly shore-based sampling under all weather conditions to track water quality and to support TMDL efforts in the watershed.
- * No other action recommended.

RIDEM SHELLFISH GROWING AREA MONITORING: GA7-2

***Approved classification scenario; Recent 30 all weather
(68/10/2016 to 8/26/19; all mTEC, 12 wet and 18 dry weather)***

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA7-2-17S	P	30	9.6	69.1
GA7-2-19S	P	30	15.3	125.2
GA7-2-21S	P	30	11.5	83.1
GA7-2-22S	P	30	9.1	42.4

***Conditionally Approved scenario; recent 15 dry weather(<0.5" rain in previous 7 days) only.
(11/22/2016 to 8/26/2019; all mTEC, 15 dry weather)***

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA7-2-17S	P	15	8.6	26.7
GA7-2-19S	P	15	12.9	33.3
GA7-2-21S	P	15	8.9	33.3
GA7-2-22S	P	15	7.2	6.7

6. Summary and Conclusions

The 2019 update demonstrated that water quality in Growing Area 7-2 (Pettaquamscutt or Narrow River) did not meet NSSP criteria under all weather conditions. The waters near station 7-2-22S (south of Sprague Bridge) did meet NSSP water quality criteria under dry weather (<0.5" rain in prior 7 days) conditions. Further monitoring is required to demonstrate that the Sprague Bridge area reliably meets NSSP criteria for shellfish harvest under various weather conditions.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

GA8 Annual Update: Greenwich Bay

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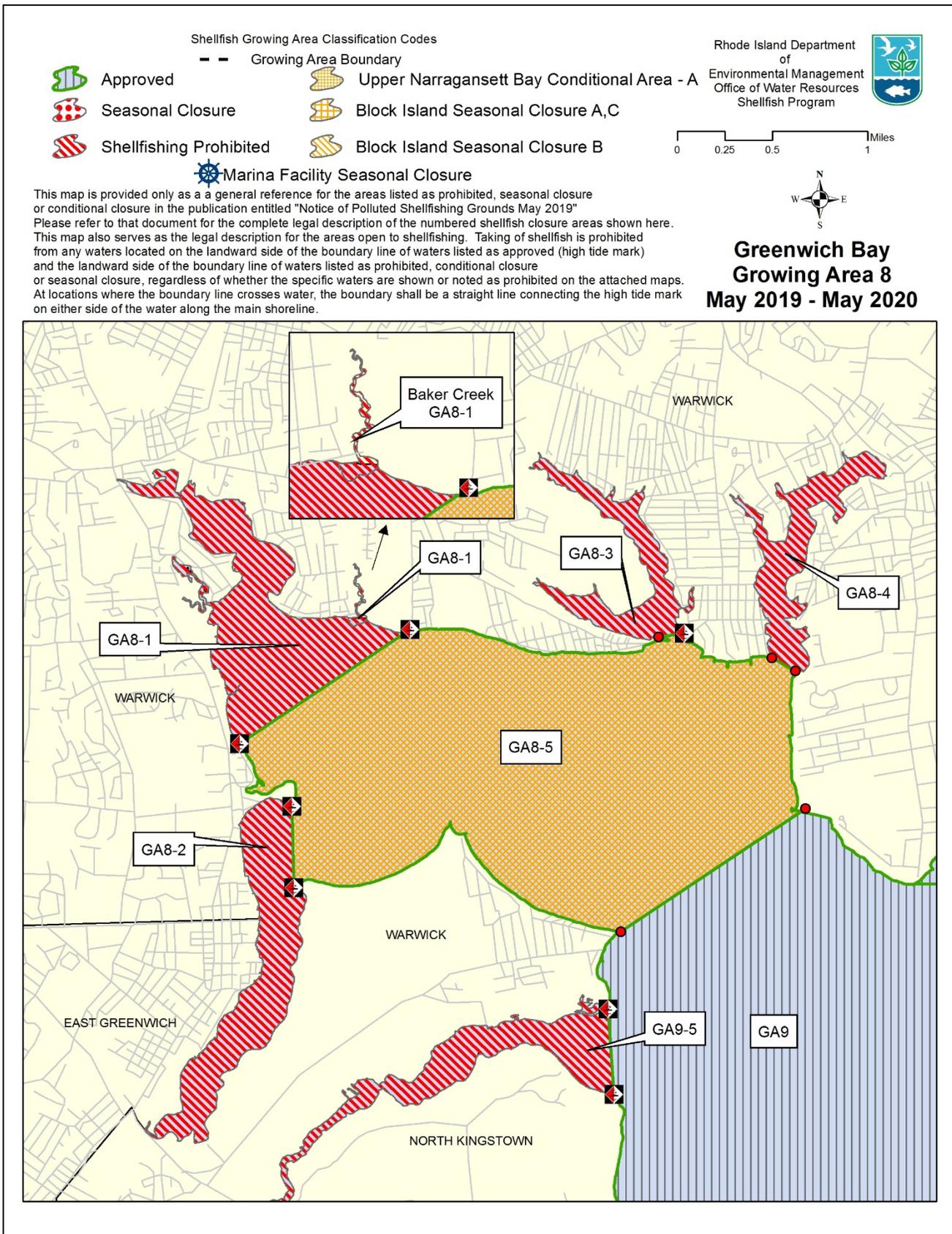
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1. Introduction

12-year shoreline surveys of the Greenwich Bay Growing Area 8 (Figure 1) were completed in 2005 and 2017. Triennial updates were completed during 2008, 2011 and 2014 while annual updates were completed during each intervening year. A total of 206 potential or actual sources were identified during the 2017 shoreline survey. Eighty-four (84) of these sources had flows while the remaining 122 were not flowing at the time of the 2017 survey. None of the flowing sources had results greater than 2,400 MPN /100 ml therefore did not warrant follow-up as per the program’s standard operating procedures for this annual review. Although no source was identified that exceeded the 2,400 MPN/100 ml criteria for follow-up sampling, several sources that had previously elevated counts were re-sampled in 2018 and 2019 to ensure they were not impacting the receiving waters.

Figure 1: 2019-2020 GA 8 Shellfish Classification Map

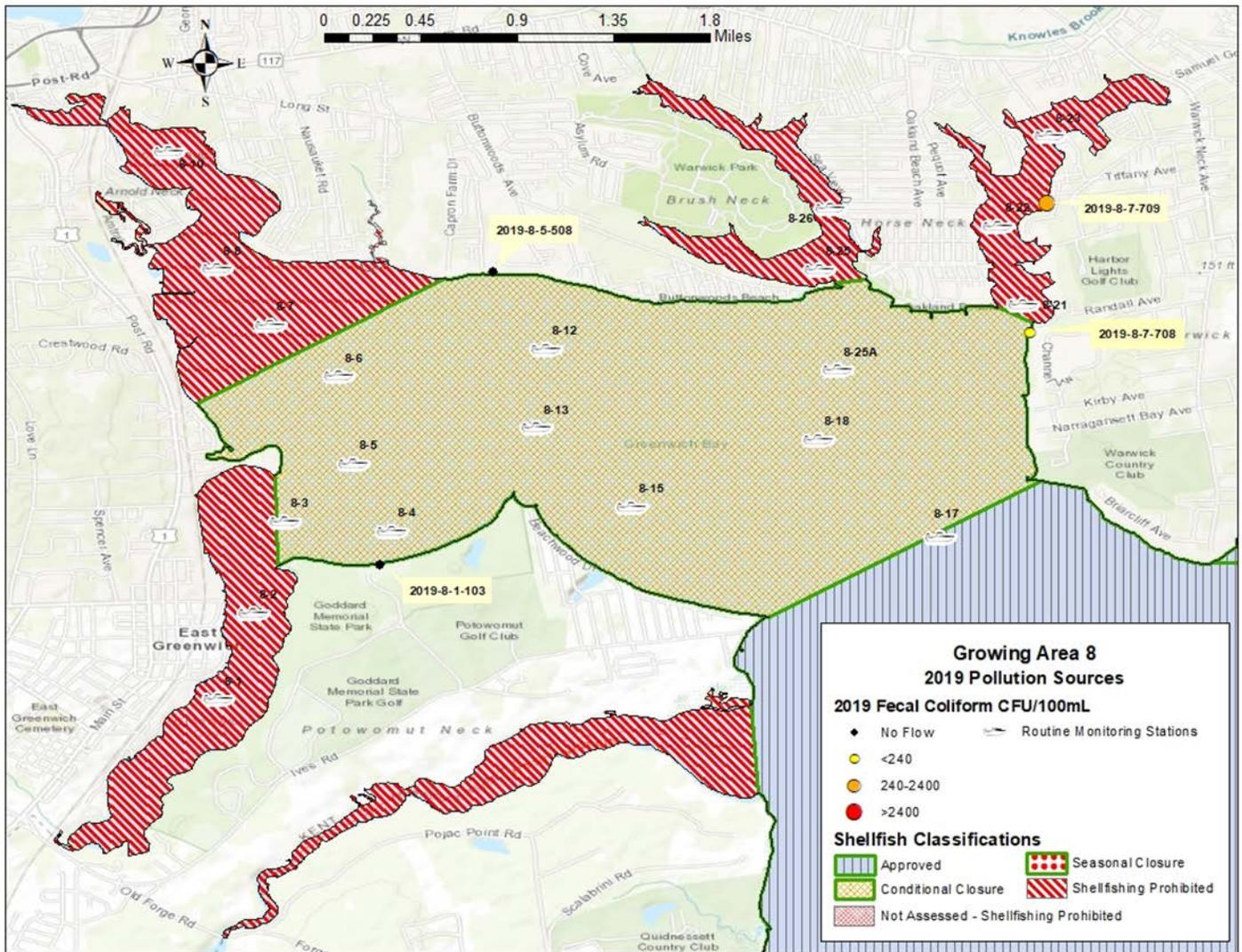


2. 2019 Shoreline Survey

Four (4) sources had shown elevated fecal coliform levels above 900 cfu/100ml and were sampled in 2019 to ensure they were not impacting the growing area (Table 1). Two (2) of the four (4) had enough flow to be sampled and two (2) sources had no flow at the time of the 2019 survey.

Source 8-4-400 had a fecal coliform result of 1200 cfu/100ml during the 2017 12-year survey. When this source was followed up in 2018, it had a fecal coliform level of 140 cfu/100 ml, well within the 240 cfu/100 threshold. Source 2018-8-7-702 and source 2018-8-7-703A also had elevated bacteria levels during the 2017 12-year survey and both have drastically decreased to less than 100 cfu/100ml when resampled in 2018 and early 2019.

Figure 2. 2019 Pollution Sources in GA 8 with Routine Monitoring Stations



Source 2019-8-5-508 (Figure 3) had a fecal coliform level of 1,000 cfu/100ml during the 2017 12-year survey and a similar result when sampled in 2018 (1,100 cfu/100ml). For the 2019 annual survey this source was not sampled because it was non flowing as sand had filled in the source (a 15” corrugated metal pipe in the sea wall; Figure 3).

Table 1: 2019 Summary of Pollution Sources in GA 8

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2017 Results mTEC cfu/100ml	2018 Results mTEC cfu/100ml	2019 Results mTEC cfu/100ml
2019-8-1-103	10/2/2019	41.666	-71.4345	Twin 24" concrete pipe in seawall with grates (No flow stagnant water below)	Conditional	P	D	1040	NS	NS
2019-8-7-709	10/7/2019	41.691	-71.3894	10" concrete pipe	Prohibited	A	D	52	NS	500
2019-8-5-508	10/2/2019	41.686	-71.4269	15" CMP conveying creek draining upstream wetland (2019 - pipe filled with sand and buried to top of pipe)	Conditional	P	D	1000	1100	NS
2019-8-7-708	1/9/2020	41.682	-71.3906	wetland drainage	Conditional	A	D	1180	1600	100

*Red highlighted sources >2400 cfu/100ml; Yellow highlighted sources > 240 cfu/100ml NF = No flow, NS = No source

Figure 3: Source 8-5-508, 15” pipe (filled with sand, no flow in 2019).



In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM’s Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program’s HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Greenwich Bay (Growing Area 8) due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

3. Marinas and Moorings

Greenwich Bay is home to thirty-three (33) marinas with over forty-four hundred (4,400) slips and moorings available to boaters. These marinas vary in size and capacity from the small private yacht club in Brushneck Cove with less than 10 slips to the large, full-service marina such as Brewer’s Greenwich Bay that have restaurants, pools, full-service repair and storage and pump out facilities. All of these marinas are located in shellfish waters that are classified as prohibited and dilution calculations have been performed to ensure that the

prohibited zone is of sufficient size to provide ample dilution zones to be protective of water quality in the adjacent waters. These calculations can be found in the programs permanent file and are tabulated in the document entitled “Marina Dilution Analysis Background, June 2017”. All the marinas have sufficient dilution waters for the slip counts and usage rates currently existing. Additional pump out facilities that are privately owned may be available and would complement the public facilities. There are currently 16 fixed pump-out locations and two mobile pump-out boats in the Greenwich Bay area to service the boating public. An inventory of pump-out facilities (both private and CVA-funded) is available for review in the CVA Program’s files.

4. Wastewater Treatment Facilities (WWTF)

The East Greenwich WWTF is a modern “Rotating Biological Contactors” secondary treatment plant that was converted to UV disinfection in February of 2004. Additional construction was completed in 2006 to meet a seasonal Total Nitrogen limit of 5 mg/l. A recent upgrade (in 2017) was the new UV system control panel. They are currently replacing their RBC (Rotating Biological Contactors) units and rehabbing their secondary clarifiers. Plant operators immediately report any permit violations or failure events to RIDEM’s Office of Operations and Maintenance (or DLE after hours) which is then conveyed directly to the shellfish program for any necessary actions according to the CAMP. The plant has a design flow of 1.7 MGD and serves approximately 6,000 customers. The plant currently has a RIPDES permitted discharge (RI0100030) that discharges into Greenwich Cove.

The facility is permitted to discharge a maximum daily of 1.70 MGD (million gallons/day) of treated effluent. The average flow for 2019 was 0.91 MGD, well within the permit limits. One (1) *Enterococci* violation was reported in 2019. A daily maximum *Enterococci* of 1,00MPN was reported, over the permitted daily max of 276 MPN on 5/31/2019. While fecal coliform is not a permit criteria, it is monitored, and monthly geometric mean fecal coliform was generally less than 5 cfu/100 ml during 2019. This review of the East Greenwich WWTF indicated that the facility is well-run and was operating well-below permitted bacteria discharge levels during 2019.

A dye study was completed in Greenwich Cove in 1986 to determine the travel time and dilution of effluent from the wastewater treatment facility. The flow rate of the effluent from the plant was 0.8-1.05 mgd. Results of the study concluded that it takes approximately 14.5 hours for the effluent from the plant to exit Greenwich Cove (Turner 1986). This portion of the growing area is classified as prohibited, and so it takes that amount of time for the discharge from the plant to enter the conditionally approved section of Greenwich Bay. In addition, prior to reaching the current defined edge of the prohibited area, the effluent is diluted by a factor of 1,700, meeting the NSSP requirements that a dilution ratio of 1,000:1 be reached within the prohibited zone.

The flow rate of effluent has not changed significantly since the completion of the dye study (2018 average flow of 0.98 MGD and past years’ flows generally between 0.8 and 1.0 MGD), and therefore, these dilution values would still apply. However, significant improvements have been made to the plant over the years, such as the installation of RBCs in 1989 and a UV disinfection system in 2004, which ultimately reduce viral loads and more efficiently eliminate pathogens in the effluent.

Finally, in the event of a wastewater treatment facility failure, the plant operator is required to inform DEM immediately so that appropriate action can be taken. This allows shellfish staff to close the conditionally approved area within 12 hours (within the 14.5-hour travel time of the effluent) and reopen when conditions have returned to normal. Per NSSP requirements if an extended failure to treat event outside of these design parameters should occur at the plant, the conditionally approved area would be closed for 21 days or until shellfish samples collected after 7 days are tested and show male-specific coliphage levels below 50 PFU/100 grams.

5. Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at eighteen (18) monitoring stations throughout the growing area. Nine (9) of the stations are in Conditionally Approved waters and nine (9) stations are located in Prohibited waters.

Samples are collected 1-2 feet below the water surface (using 4-ounce sterile Nalgene bottles) after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics for GA4 were analyzed by the mTEC method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 8 (Greenwich Bay)

HIGHLIGHTS

- * Sampled 9X during 2019.
- * GA8 conditional area closed for most of June, July and December 2019 due to prolonged wet weather.
- * Statistics represent recent 15 samples collected between 5/23/2018 and 11/14/2019 for most stations
- * Statistics represent recent 15 samples collected between 11/14/2017 and 11/14/2019 for stations 8-25 and 8-26 which are in shallow coves that cannot be sampled at low tide.
- * All samples analyzed by the MTEC method.
- * All conditionally approved stations are in compliance.
- * Data run 2/12/2020.

COMMENTARY

Greenwich Bay (GA8) was sampled nine times during 2019 with all samples collected while the area was in the open status. Prolonged wet weather during June, July and December 2019 prevented the usual monthly collection of samples during those months. Growing Area 8 is conditionally approved with a 0.5" rain closure threshold. Frequent greater than 0.5" rainstorms during June 2019 kept the area in the closed status for all but six weekdays on which sampling could occur. Similarly, frequent wet weather during July 2019 kept the area in the closed status for all but five full weekdays. December 2019 was exceptionally wet, with 8.11" of precipitation recorded at TF Green Airport (KPVD weather station) compared to an average December rain of 4.79". This rainfall kept Growing Area 8 in the closed status for 26 of 31 days of December 2019 with December 26-29 the only full days the area was in the open status. Because of this the 2019 compliance data set includes nine observations from 2019 and six observations from 2018.

The 2019 statistical evaluation showed that all conditionally approved stations in Greenwich Bay (GA8) were in compliance. 'Sentinel stations' in prohibited areas of Greenwich Cove (station 8-3), Apponaug Cove (station 8-7) and Warwick Cove (station 8-21) that are located adjacent to open areas also met criteria for conditionally approved waters. The 2019 statistical review demonstrated that the conditionally approved area of Greenwich Bay (GA8) is in program compliance and is properly classified.

RECOMMENDATIONS

- * Maintain Greenwich Bay as conditionally approved year-round (December seasonal closure ended in May 2017).
- * Continue to sample prohibited areas in Greenwich, Apponaug, Buttonwood, Brushneck and Warwick Coves to track water quality changes in support of TMDL work in the watershed.

RIDEM SHELLFISH GROWING AREA MONITORING: GA8

***Recent 15 when area was open (all dry weather).
(5/23/18 to 11/14/2019; all mTEC)***

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA8-1	P	15	6.6	6.7
GA8-2	P	15	6.8	13.3
GA8-3	P	15	3.0	0.0
GA8-4	CA	15	2.3	0.0
GA8-5	CA	15	2.8	6.7
GA8-6	CA	15	3.9	6.7
GA8-7	P	15	3.3	6.7
GA8-8	P	15	4.4	6.7
GA8-10	P	15	11.9	26.7
GA8-12	CA	15	3.3	0.0
GA8-13	CA	15	2.9	6.7
GA8-15	CA	15	2.8	0.0
GA8-17	CA	15	2.1	0.0
GA8-18	CA	15	2.1	0.0
GA8-21	P	15	3.5	0.0
GA8-22	P	15	5.1	0.0
GA8-23	P	15	6.3	13.3
GA8-25A	CA	15	2.7	0.0

*Recent 15 when area was open (all dry weather).
(11/14/2017 to 11/14/2019; all mTEC)*

FECAL-GEO

<u><i>Station Name</i></u>	<u><i>Status</i></u>	<u><i>N</i></u>	<u><i>MEAN</i></u>	<u><i>%>CRITICAL 31 cfu/100 ml</i></u>
GA8-25	P	15	5.4	13.3
GA8-26	P	15	7.4	20.0

6. Summary and Conclusions

The 2019 annual update of Greenwich Bay (GA8) demonstrated that no shoreline sources are negatively impacting the microbiological water quality of the growing area when this conditionally approved area is in the open status for shellfish harvest. In addition, the one (1) WWTF in the growing area was shown to be operating in an efficient manner that consistently resulted in effluent flow and fecal coliform concentration being well below permitted discharge levels. A statistical review of water column fecal coliform collected while the conditionally approved area was in the open status indicated that the Greenwich Bay (Growing Area 8) is in program compliance and is properly classified.

Growing Area 8 is a conditionally approved growing area, impacted by precipitation events and also containing a discharge from a sewage treatment facility. Therefore, the RIDEM Shellfish Program monitors Growing Area 8 in accordance with the guidelines set forth in the Greenwich Bay Conditional Area Management Plan (CAMP) established in January 1996. Although the document is outdated it is still valid due to the positive improvements within the watershed to deal with stormwater impacts as recommended in the TMDL, reduction of OWTS and improvements to the WWTF. This document has been rewritten in 2019 in response to the 2017 FDA PEER evaluation recommendations. The CAMP for Greenwich Bay Growing Area 8 was re-evaluated for this annual review and the monitoring and management actions were in compliance with the management plan as currently written and going forward.

No classification changes are recommended for GA8 at this time.

**West Middle Bay
Growing Area 9
12 Year Sanitary Shoreline Survey
Calendar Year 2019**



Quonset Point – West Middle Bay

**Rhode Island Department of Environmental Management
Office of Water Resources
Shellfish Monitoring Program**



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Acronyms and Terms

cfu/100 ml: colony forming units per 100 ml seawater

FDA: Food and Drug Administration

ISSC: Interstate Shellfish Sanitation Conference

MPN: Most Probable Number

NSSP: National Shellfish Sanitation Program

RIDEM: Rhode Island Department of Environmental Management

SGAM: Shellfish Growing Area Monitoring

SSCA: State Shellfish Control Authority

NOAA: National Oceanographic and Atmospheric Administration

1. Introduction

A shoreline survey of the West Middle Bay was conducted during the summer of 2019 by staff from RIDEM's Office of Water Resources. The survey involved a shoreline reconnaissance of the entire study area to locate and catalog pollution sources and collect bacteriological samples from all sources actively flowing into the survey area. A 12-year survey of the area was completed in 2007 and triennial updates of the area were completed in 2010, 2013, and 2016. The 2019 shoreline survey of GA9 (West Middle Bay) is a 12-year shoreline survey.

The primary objective of the shoreline survey was to identify and characterize any new sources of pollution potentially impacting the growing area, to reevaluate point and non-point sources identified during previous surveys, and to update information regarding the sampling of previously identified sources and to reevaluate the current classifications of all shellfish waters of Growing Area 9.

2. Description of the Growing Area

A. Location

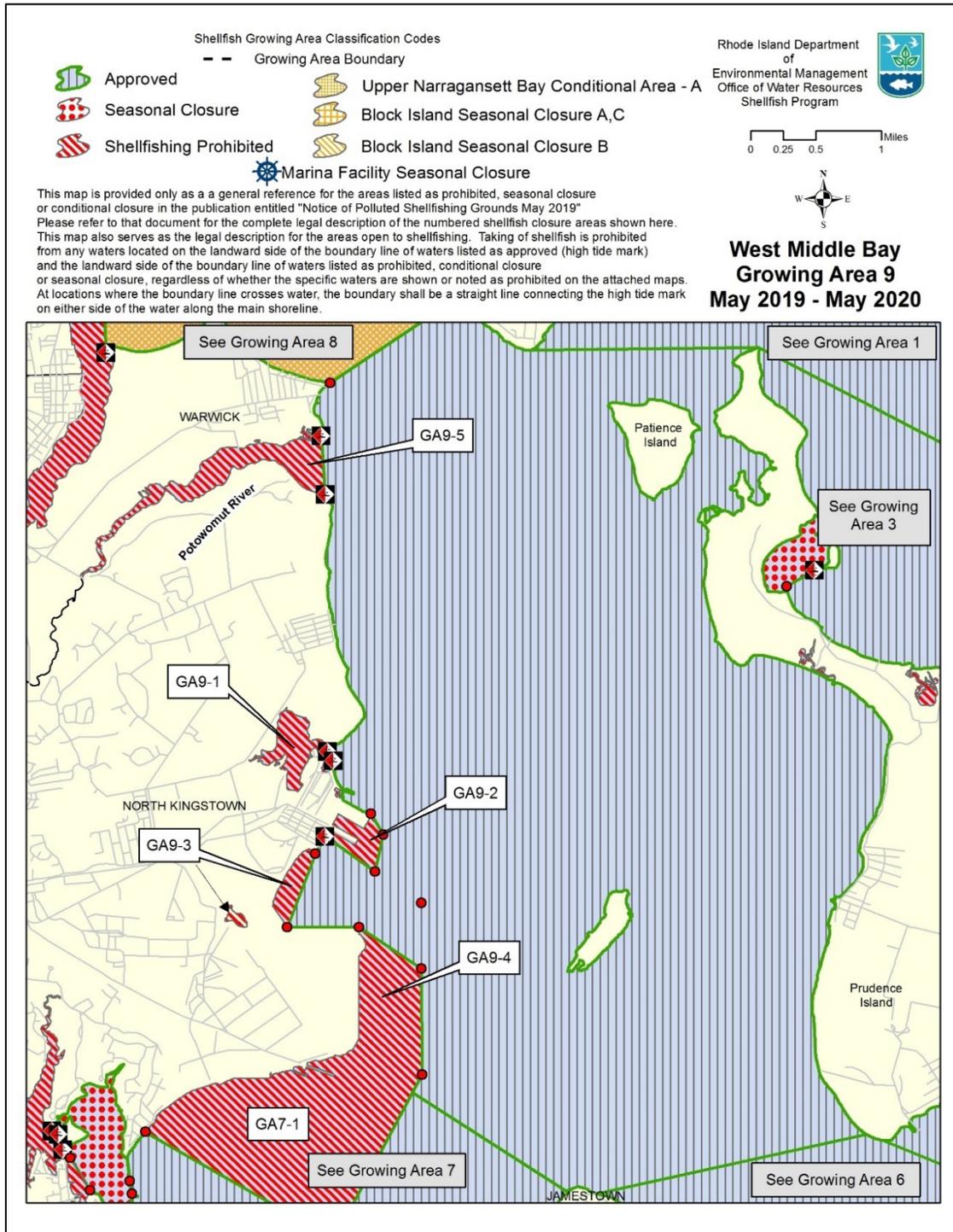
The West Middle Bay shellfish growing area (GA9) is the area of western Narragansett Bay approximately bounded by North Kingstown to the west and Prudence Island to the east (Figure 1). The area is south of a line extending from the northern tip of Prudence Island across to the southern tip of Warwick Neck; across the opening of Greenwich Bay to Sandy Point, and north of a line from Quonset Point to the northern point of the Conanicut Island (Jamestown) and the southern tip of Prudence Island. The communities of North Kingstown, Warwick, and Portsmouth (Prudence Island) are adjacent to this growing area. Growing area 9 (West Middle Bay) is presently comprised of sections classified as either approved or prohibited for shellfishing (Figure 1).

B. Physical Description

The West Middle Bay growing area encompasses approximately 14,300 acres. The shoreline immediately adjacent to the growing area consists of a mixture of primarily urban/built-up lands, forest, and brush-lands marked by a drastic variance between the virtually un-developed shoreline of Prudence Island to the east of the growing area and the commercial ports and developed landscape along the western shoreline. The adjoining towns rely upon Onsite wastewater treatment systems (OWTSs) for wastewater treatment except for the Davisville Depot and the Quonset Point Port and Commerce Park which discharges treated effluent from their wastewater treatment facility into the growing area.

Growing area 9 contains five distinctive prohibited areas encompassing approximately 668 acres all located along the western boundary of the growing area. The prohibited

Figure 1: Current (2019-2020) classification map of GA9 (West Middle Bay)



areas remain closed to shellfishing because of the industrial commercial nature of the land use and numerous marinas and boat moorings in the area of the Davisville Depot and the Quonset Point Port. These two areas encompass approximately 381 acres of the West Middle Bay growing area. The other prohibited marina area is in Allen Harbor, a 93-acre cove with a significant number of commercial and recreational moorings and

dockage. This area is also adjacent to a former Naval dumpsite that has contaminated soils, groundwater and the marine sediment of Allen Harbor (US Navy, 1984). The fourth area is a small tidally influenced pond called Fry's Pond that is connected to the waters of West Middle Bay *via* an underground culvert beneath the runway at Quonset Point and includes the area this culvert discharges to in the bay. This area encompasses approximately eight and a half acres. The fifth prohibited area is the entirety of the Potowomut River, a 186-acre area draining a high-density residential area which exceeds NSSP criteria. A study has demonstrated that the freshwater Hunt River and the estuarine Potowomut River has exhibited elevated fecal coliform loading during wet weather (RI DEM, 2001; 2011). A TMDL has completed for the Hunt River (DEM, 2001) and a TMDL for the Potowomut River is scheduled for 2023.

C. Latest Survey

RIDEM's Office of Water Resources personnel conducted a 12-year shoreline survey in 2007 to assess the relative importance of pollution sources impacting the growing area's water quality. Triennial updates of the growing area were completed in 2004, 2010, 2013 and 2016. The 2019 survey was a 12-year comprehensive shoreline survey.

D. Current Classification Map

Prohibited areas in the current (2019-2020) classification of GA9 are described below and the current classification map is shown in Figure 1.

E. Legal Description

Shellfishing is prohibited in the following areas of GA9:

GA9-1 Allen Harbor, west of a line from the Rhode Island Department of Environmental Management range marker on the southeastern most extremity of Calf Pasture Point, to the Rhode Island Department of Environmental Management range marker on the northeastern most extremity of Spink Neck, including Allen Harbor, Little Allen Harbor, and the entrance channel in their entirety.

GA9-2 The waters in the vicinity of Piers #1 and #2 at the Davisville depot that are south of a line from the northeast corner of Pier #2 (the more northerly pier at the Davisville depot) to nun buoy "16" and north and west of the intersection of the lines from the Rhode Island Department of Environmental Management range marker located on the bulkhead at approximately 300 feet south of Pier #1 (the more southerly pier at the Davisville depot) to nun buoy "12", and a line from the northeastern end of the bulkhead at Quonset State Airport through nun buoy "16".

GA9-3 Fry's Pond in its entirety and all waters in so called Fry's Cove west of a line from the most southern point of the wooden bulkhead at the southeast corner of the Quonset-Davisville Commerce Park to the inside north-west corner of the stone bulkhead containing the Quonset State Airport runways.

GA9-4 Included in description of closure number GA7-1

GA9-5 The waters of the Potowomut River west of a line from the Rhode Island Department of Environmental Management range marker located on Marsh Point on the northern shoreline to the Rhode Island Department of Environmental Management range marker located on Pojac Point on the southern shore.

F. Comparison with Previous Classification Maps

The 2007 classification (Figure 3) map differs from the current (2019-2020;) classification map in two ways: 1) In May 2011 Fry's Cove was reclassified as prohibited due to concerns about water quality impacts from runoff from the Quonset Airport and the outlet from Fry's Pond. 2) In May 2010, and again in 2013, the prohibited area boundary line near the mouth of the Potowomut River was moved eastward (seaward) due to elevated wet-weather fecal coliform loading in the Potowomut River watershed. The current location of the closure line is across the mouth of the Potowomut River (a line extending from Pojac Point to Marsh Point) and monitoring station 9-5 (Figure 3) serves as a sentinel station to ensure degraded water quality does not extend beyond the prohibited waters of the Potowomut River.

Figure 2: 2007 classification map of GA9 (West Middle Bay)

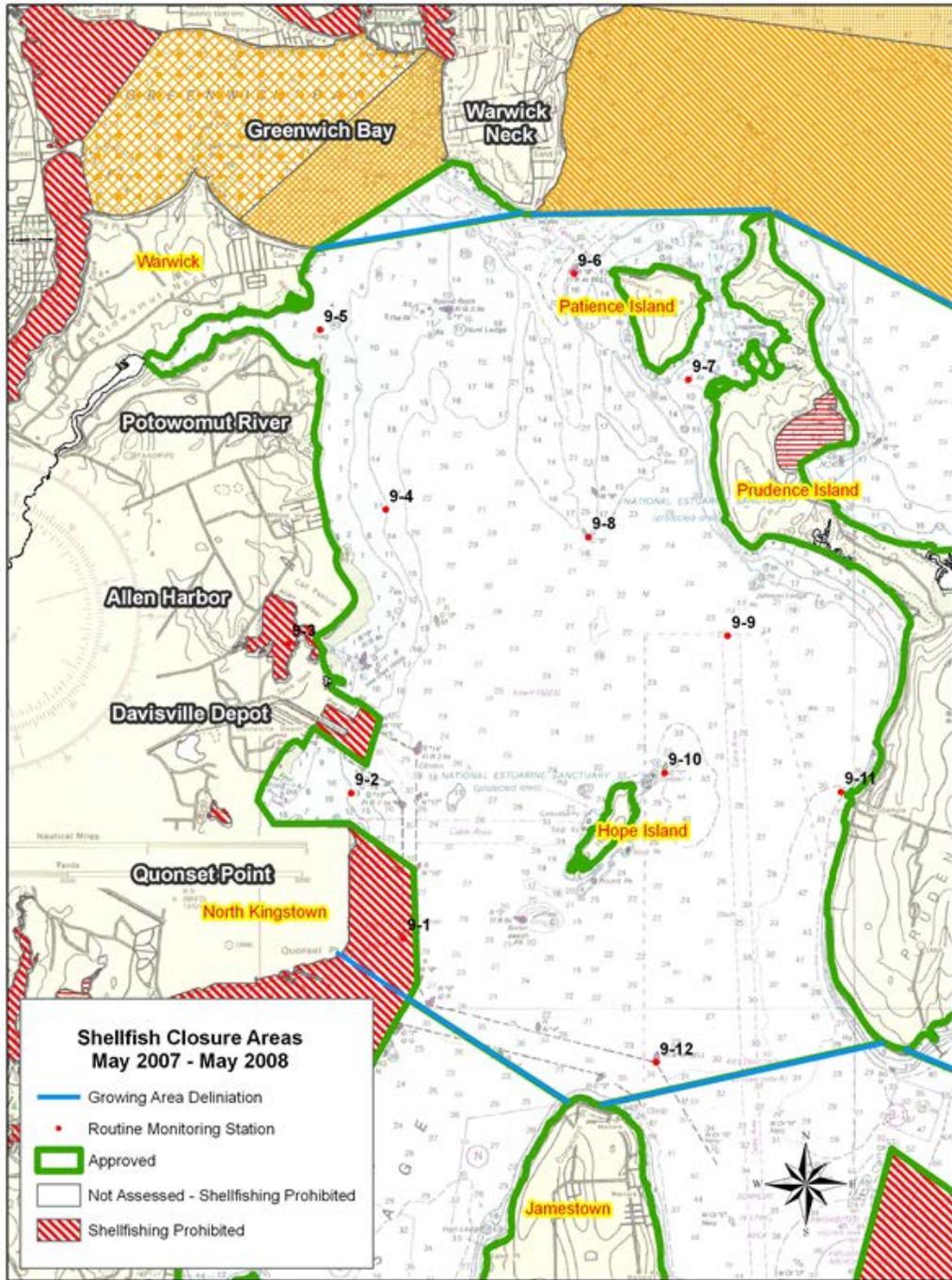
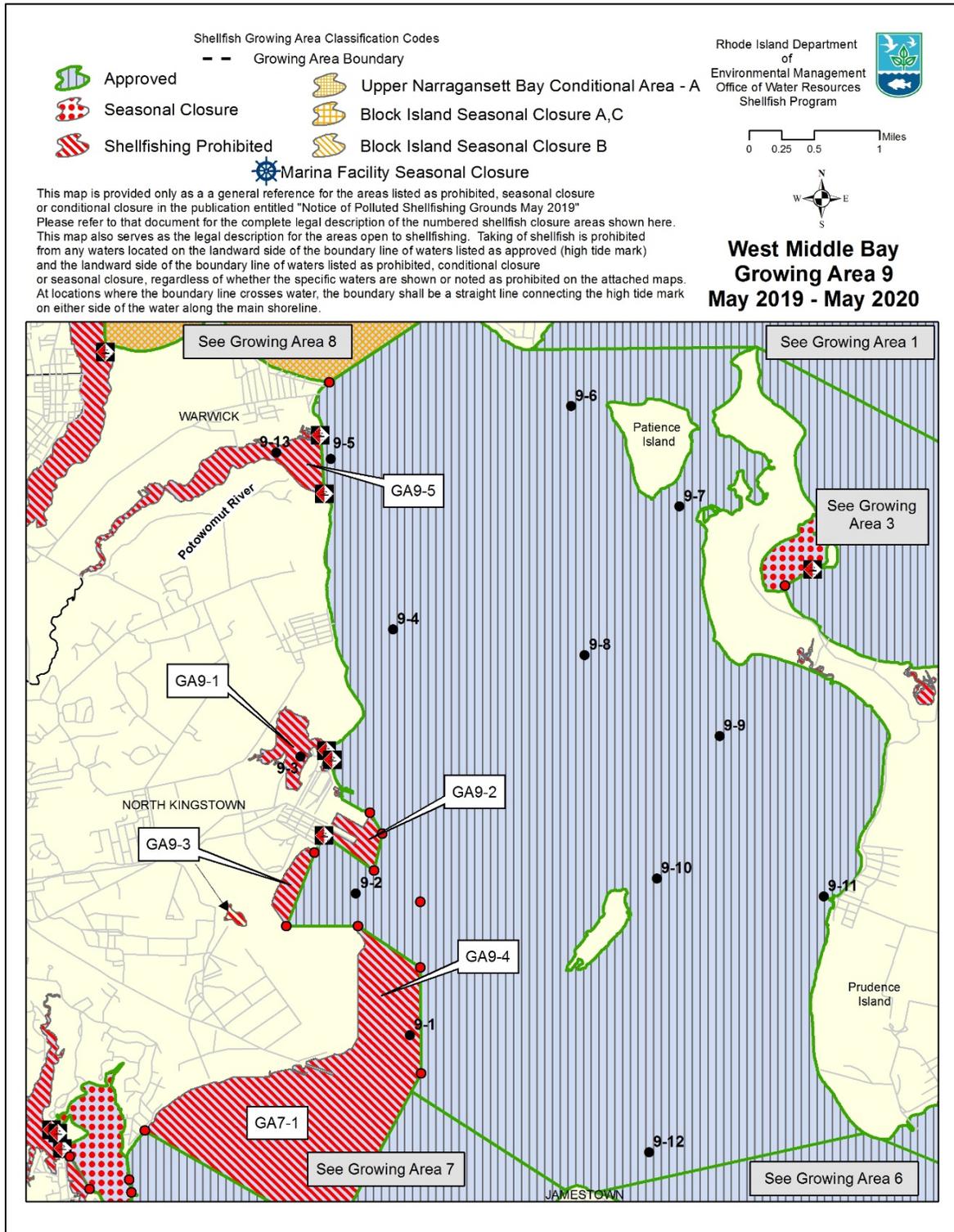


Figure 3: Current (2019-2020) Classification Map with Routine Monitoring Stations



3. Pollution Source Survey

A. Personnel

Steven Rogers, Biologist for the RIDEM Office of Water Resources Shellfish Section, coordinated and conducted a shoreline reconnaissance of West Middle Bay with the assistance of other RIDEM Office of Water Resources Shellfish and TMDL staff members. Teams of surveyors were organized and assigned to each section of the bay to inspect the entire shoreline.

B. Survey procedures

In early July 2019, a planning meeting was arranged in which staff from RIDEM discussed the logistics necessary to meet and complete the requirements of a 12-year sanitary shoreline survey for the West Middle Bay. The West Middle Bay of RI's Narragansett Bay was divided into three sections, 1) Prudence Island and its associated smaller islands, 2) the entirety of the Potowomut River south to Allen Harbor, and 3) Quonset point (Figure 2). Teams of two were assigned to survey each area over several days in mid- to late-July 2019. Those areas that could not be covered during those two days were sampled later in the fall by RIDEM Office of Water Resources Shellfish staff.

All necessary survey materials were provided to each team, including aerial maps created using ArcMap GIS software that displayed the locations of all previously identified sources. Each team assigned to an area was given the appropriate map; pre-filled field sheets including source IDs, descriptions, and geographic coordinates; information on public access points and street maps for parking; and extra field sheets and laboratory sample submission chain of title forms. In addition, each team was equipped with a GPS-enabled digital camera or their personal cell phone, a means for measuring flows such as a bucket or float, coolers, extra sample bottles, and first-aid kits. The 2019 shoreline surveys of each section of GA9 took place on the following dates:

Potowomut River to Quonset Point:	July 15, 2019
Tidal Potowomut River:	July 15-16, 2019
Prudence Island and Patience Island:	July 29-31, 2019
Hope Island and Quonset Point:	10/24/19 (boat survey)

The shoreline survey on July 15-16, 2019 occurred three (3) and four (4) days after rain of 1.01" at TF Green Airport (NWS weather station KPVD). The shoreline survey on July 29-30, 2019 took place six (6) and seven (7) days after rain of 1.00" fell at nearby TF Green Airport. The survey by boat on 10/24/2019 took place one (1) day after 0.38" rain fell at TF Green Airport.

Special attention was given to all types of pipes, drainage ditches, culverts, and streams in order to classify them as a direct (discharges directly to the growing area), indirect (does not discharge directly to the growing area but may contribute to pollution), actual (discharging at the time of the survey), or potential (not actively discharging at the time of the survey but considered a possible source of pollution). Samples were collected near

the water surface (using 125 ml sterile Nalgene bottles) or other pre-sterilize bottles provided by RIDOH, after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. The mTEC membrane filtration method, as described in Standard Methods for the Examination of Water and Wastewater (APHA, 1999) was used for fecal coliform sample analysis. The mTEC method allows for a holding period of 30 hours and all samples were stored on ice and delivered to the Health Lab within the 30-hour holding time.

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas were visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation was conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation was conducted as warranted.

C. Summary of Sources and Locations

There were sixty-one (61) actual and potential pollution sources identified during the shoreline survey in 2019. Thirty-nine (39) sources were flowing at the time of sampling. All sources in which flow was observed were sampled. Six (6) sources had bacteria counts that exceeded 240 CFU/100 ml, and one (1) of these sources exceeded 2,400 CFU/100 ml. The location of all sources is shown in Figure 4 and the fecal coliform results and the flow rates for each source are shown in Table 1.

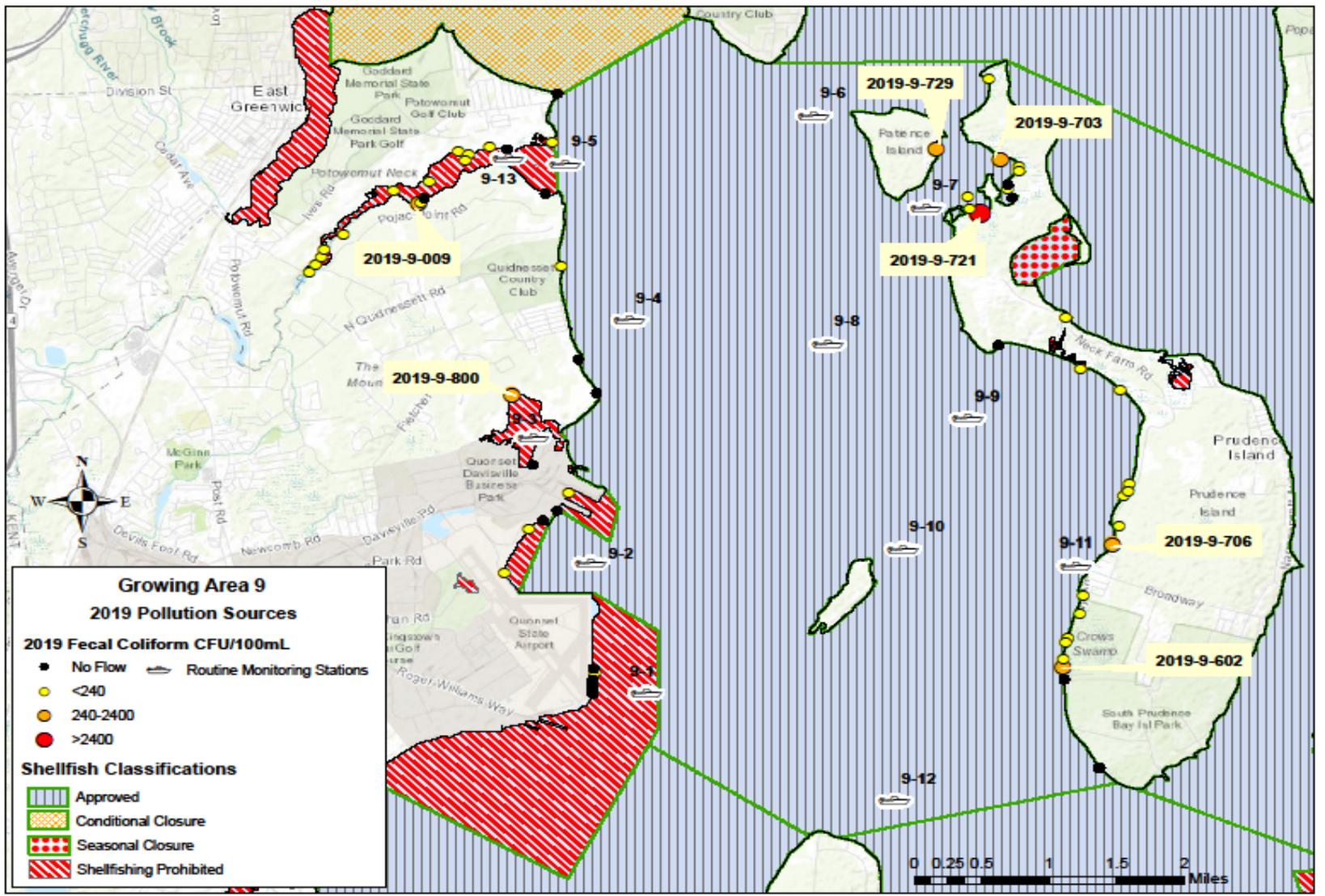


Figure 4: GA9 Pollution Sources and fecal coliform results from 2019 survey.

Table 1: 2019 Summary of Pollution Sources in GA9

***Red highlighted sources >2,400 cfu/100 ml; Yellow highlighted sources > 240 cfu/100 ml NF = No flow, NS = No source**

Source ID	Latitude	Longitude	Description	Receiving Waters Classification	Survey Date	Direct/ Indirect	Potential/ Actual	2007 FC Results (MPN/100 ml)	2019 FC Results (CFU/100 ml)	Volumetric Flow (ft ³ /s)
2019-9-001	41.65553	-71.42177	Outlet from small tidal pond on ground of rocky hill school	Prohibited	16-Jul	D	A	4	<100	7.28
2019-9-002	41.65593	-71.42323	Outlet from small tidal pond 200 yards north of rocky hill school	Prohibited	16-Jul	D	A	93	100	0.71
2019-9-003	41.65647	-71.41876	Outlet from tidal pond south of 9-001 rocky hill school	Prohibited	16-Jul	D	A	9	<100	6.8
2019-9-004	41.65698	-71.40982	Outlet from large tidal area at confluence of Potowomut and bay	Prohibited	16-Jul	D	A	4	<100	
2019-9-006	41.64139	-71.44461	small stream under Pojac Rd into upper Potowomut River	Prohibited	17-Jul	D	A	93	100	<0.01
2019-9-007	41.645833	-71.4397167	Small stream over stone dam, bamboo stand, near 3 Pojac Point Rd	Prohibited	16-Jul	D	A	NF	200	0.02
2019-9-009	41.64967222	-71.4288889	Seep near old Concrete / Iron slab	Prohibited	16-Jul	D	A	NS	360	<0.01
2019-9-010	41.65079	-71.41076	4" PVC pipe in embankment	Prohibited	17-Jul	D	P	NF	NS	
2019-9-010A	41.65027778	-71.42805556	2 in black plastic pipe down bank	Prohibited	16-Jul	I	A	NF	NS	
2019-9-011	41.64204	-71.40855	Tibbets Creek at Quidnessett Country Club	Approved	17-Jul	D	A	460	200	38.63
2019-9-012	41.65079	-71.41076	12" CMP storm drain between 61 & 71 Narragansett Ave	Prohibited		I	P	0	NS	
2019-9-013	41.63073	-71.40601	Outlet from upland tidal marsh dissipates into sand prior to high tide line	Approved		D	P	93	NS	
2019-9-014	41.62666	-71.40345	Outlet from tidal marsh, dissipates into sand prior to high tide	Approved		D	P	0	NS	

Source ID	Latitude	Longitude	Description	Receiving Waters Classification	Survey Date	Direct/ Indirect	Potential/ Actual	2007 FC Results (MPN/100 ml)	2019 FC Results (CFU/100 ml)	Volumetric Flow (ft ³ /s)
2019-9-015	41.64967222	-71.42861111	Seep at high tide line / Marsh	Prohibited	16-Jul	D	A	NF	<100	<0.01
2019-9-200	41.61125	-71.41113	Groundwater seep south of Davisville Bulkhead	Prohibited			A	4		
2019-9-201	41.61019	-71.41324	Small stream draining upland tidal marsh/wetland	Prohibited	15-Jul	D	A	2300	100	1.45
2019-9-202	41.60495	-71.41669	(2) 48" dia. RCP culverts under runway, outlet of Fry's Pond	Prohibited	15-Jul	D	A	430	<100	
2019-9-400	41.6180018	-71.4125527	12" CMP under Allen Harbor Road	Prohibited	24-Oct	D	P	NS	NF	
2019-9-401	41.6145186	-71.4075319	Pipe exiting Ship dock	Prohibited	24-Oct	D	A	NS	<100	<0.01
2019-9-402	41.6124291	-71.4090863	cement pipe exiting wall, half way submerged at low tide, high tide fully submerged	Prohibited	24-Oct	D	P	NS	NF	
2019-9-403	41.5933144	-71.4038858	12" PVC pipe draining airport runway surface	Prohibited	24-Oct	D	P	NS	NF	
2019-9-404	41.5927256	-71.4038154	12" PVC pipe draining airport runway surface	Prohibited	24-Oct	D	P	NS	<100	
2019-9-405	41.591923	-71.404034	12" PVC pipe draining airport runway surface	Prohibited	24-Oct	D	P	NS	NF	
2019-9-406	41.591396	-71.404031	12" PVC pipe draining airport runway surface	Prohibited	24-Oct	D	P	NS	NF	
2019-9-407	41.590759	-71.404034	12" PVC pipe draining airport runway surface	Prohibited	24-Oct	D	P	NS	NF	
2019-9-408	41.590258	-71.404032	12" PVC pipe draining airport runway surface	Prohibited	24-Oct	D	P	NS	NF	
2019-9-502	41.65234	-71.42744	Potowomut River midway between narrows @ confluence with bay	Prohibited	24-Oct			23	200	
2019-9-502A	41.6549	-71.4223	Potowomut River	Prohibited	24-Oct			4	<2	
2019-9-600	41.62951	-71.33438	Jenny's Creek outlet north of Home Beach	Approved	30-Jul	D	A	43	<100	22.58

Source ID	Latitude	Longitude	Description	Receiving Waters Classification	Survey Date	Direct/ Indirect	Potential/ Actual	2007 FC Results (MPN/100 ml)	2019 FC Results (CFU/100 ml)	Volumetric Flow (ft ³ /s)
2019-9-601	41.62689	-71.32864	Unnamed stream south of Home Beach, Prudence Island	Approved			A	9	<100	
2019-9-602	41.5934	-71.3369	Small stream flowing over rock ledge	Approved	30-Jul	D	A	NS	300	0.18
2019-9-603	41.5944	-71.3369	Small stream flowing over rock ledge	Approved	30-Jul	D	A	NS	<100	<0.01
2019-9-604	41.5964	-71.3365	Small stream flowing over rock ledge (trickle)	Approved	30-Jul	D	A	NS	<100	<0.01
2019-9-605	41.5967	-71.3363	Small stream flowing over rock ledge	Approved	30-Jul	D	A	NS	200	<0.01
2019-9-606	41.597	-71.3362	Small stream flowing over rock ledge	Approved	30-Jul	D	A	NS	100	0.37
2019-9-607	41.5998	-71.3345	Small stream flowing over rock ledge	Approved	30-Jul	D	A	NS	100	0.50
2019-9-608	41.6021	-71.334	Small stream flowing over rock ledge	Approved	30-Jul	D	A	NS	<100	0.04
2019-9-609	41.6104	-71.3289	Small stream under road and then crossing beach	Approved	30-Jul	D	A	NS	100	0.07
2019-9-612	41.59190	-71.33670	8" cast iron pipe, at bank above beach. Looks like it has not had flow in years. Near NW border of Reserve	Approved	29-Jul	D	P	NF	NF	
2019-9-700	41.65405	-71.34312	Small tidal creek in Coggeshall Cove, Prudence Island	Approved	29-Jul	D	A	4	100	0.06
2019-9-701	41.65355	-71.34312	Large tidal stream in Coggeshall Cove, Prudence Island	Approved	29-Jul	D	A	4	<100	0.47
2019-9-705	41.64884	-71.35017	Small tidal stream draining sheep's pen cove	Approved	30-Jul	D	A	3	<100	8.50
2019-9-703	41.65492	-71.34576	Middle Coggeshall Cove	Approved	7/29/2019	D	A		800	0.09
2019-9-706	41.60826	-71.32981	Stream bed north of Prudence park jetty, potential for heavy flows	Approved	30-Jul	D	A	0	500	0.89

Source ID	Latitude	Longitude	Description	Receiving Waters Classification	Survey Date	Direct/ Indirect	Potential/ Actual	2007 FC Results (MPN/100 ml)	2019 FC Results (CFU/100 ml)	Volumetric Flow (ft3/s)
2019-9-707	41.63563	-71.33646	Oyster Farm pond at headwaters of Jenny's Creek	Approved	31-Jul	D	A	3	<100	
2019-9-710	41.6647258	-71.3473576	Stream draining upland marsh spreads out over sand	Approved	29-Jul	D	A	NS	<100	0.12
2019-9-711	41.6518159	-71.3445983	Groundwater seep or stream draining march across from large rock	Approved	16-Jul	D	P	NS	NF	
2019-9-712	41.6502462	-71.343915	GW Seep	Approved	16-Jul	D	P	NS	NF	
2019-9-721	41.648288	-71.348626	Small groundwater seep between 9-704 and 9-705	Approved	29-Jul	D	A	NS	3600	0.06
2019-9-722	41.6155065	-71.3273839	Groundwater seep	Approved	30-Jul	D	A	NS	<100	<0.01
2019-9-723	41.6149	-71.3276	Small stream runoff from Bay Rd	Approved	30-Jul	D	A	NS	100	<0.01
2019-9-724	41.6147	-71.3276	Small stream runoff from Bay Rd	Approved	30-Jul	D	A	NS	<100	<0.01
2019-9-725	41.6141	-71.3282	Small stream runoff from Bay Rd	Approved	30-Jul	D	A	NS	100	<0.01
2019-9-729	41.6561513	-71.3548614	Stream draining marsh on W side of Patience Island	Approved	31-Jul	D	A	NS	400	0.79
2019-9-731	41.6324054	-71.3459598	grey seep at hightide mark, no flow	Approved	30-Jul	D	P	NS	NS	
2019-9-800	41.6265	-71.41557	24" Culvert draining marsh	Prohibited	15-Jul	D	A	NS	300	1.28
2019-9-801	41.6629	-71.40903	Stream draining retention pond behind building	Prohibited	16-Jul	I	P	NS	NF	
2019-9-802	41.6562	-71.4162	Stream from marsh	Prohibited	16-Jul	D	P	NS	NF	
2019-9-803	41.6432	-71.4429	Stream draining pond into North bank of Potowomut River	Prohibited	16-Jul	I	A	NS	100	4.60
2019-9-804	41.644	-71.4425	Small stream draining pond into N bank of Potowomut River	Prohibited	16-Jul	D	A	NS	<100	0.27

D. Detailed Description of Major Sources

Only one (1) source exceeded the 2,400 CFU/100 ml benchmark during the 2019 survey. This source (source 2019-9-721; Figure 5) was a small groundwater seep draining a wetland on the southern side of Sheep Pen Cove on Prudence Island that had a 3,600 cfu/100 ml on 7/29/19. The source was shallow had a low flow rate (.06 cubic ft/sec) and it is possible that the sample was contaminated with sediment during sample collection which may have contributed to the elevated results. However, instream samples collected north and south of where the seep enters the receiving waters had results of 9 cfu/100 ml (north of source) and 2 cfu/100 ml (south of source) demonstrating that this low-flow seep had little impact on the bacterial water quality of the growing area. This source should be resurveyed during the 2020 annual evaluation.



Figure 5: Source 9-721

Six (6) other sources had fecal coliform results of greater than 240 cfu/100 ml but less than 2,400 cfu/100 ml. These sources are highlighted in yellow in Table 1 and are described below. Source 2019-9-009, with a result of 300 CFU/100 ml, was a groundwater seep on the south bank of the Potowomut River. The flow was only a trickle (.0067 cubic ft/sec) and the source enters waters that are classified as prohibited. There is sufficient dilution in prohibited waters to mitigate this source before it could impact approved shellfish harvest waters.



Figure 6: Source 9-009

The second source which exceeded the 240 cfu/100 ml limit was source 2019-9-602. This source is a small stream on the southwest side of Prudence Island that flows over a rock ledge directly into the water of GA9 that had a fecal coliform concentration of 300 cfu/100 ml. The stream had a low flow rate (0.18 cubic ft/sec) and the receiving waters are relatively deep and open to the West Passage of Narragansett Bay. This suggests that the fecal coliform from this source would be rapidly diluted and have little impact on the growing area.



Figure 7: Source 9-602

Source 2019-9-703 is a tidal stream draining a salt marsh into Coggeshell Cove on the northwest portion of Prudence Island. This source had a fecal coliform result of 800 cfu/100 ml and a low flow rate (.0923543 cubic ft/sec) at low tide. This source flows into an approved area. However, instream samples results showed low fecal coliform concentration (16 cfu/100 ml north of the source; < 2 cfu/100 ml south of the source). The low flow rate of this source and the low in-stream results demonstrated that this source has little impact on the fecal coliform water quality of the growing area.



Figure 8: Source 9-703

The fourth source which exceeded the 240 cfu/100 ml benchmark was source 2019-9-706, with a result of 500 cfu/100 ml. This source is a small stream of low flow rate (.89 cubic ft/s) flowing from under Bay Road in the area just north of Prudence Park jetty. This source flows directly into West Middle Bay. Companion in-stream samples showed low bacteriological numbers (in-stream north = 12 cfu/100m l; in-stream south = < 2 cfu/100 ml). The low in stream results demonstrated that this source is rapidly diluted in the receiving waters and has little impact on the microbiological water quality of the growing area.

The fifth source which exceeded the 240 CFU/100 ml benchmark was source 2019-9-729. This source is a small stream (flow rate of .79 cfs) draining a marsh on the west side of Patience Island, a small island having no permanent residences. This source had a result of 400 cfu/100 ml. Companion in-stream samples had low fecal coliform results of 2 cfu/100 ml (in stream north) and 2 cfu/100 ml (in stream south). The low in stream fecal coliform results indicated that the source is quickly diluted by the relatively deep and tidally flushed receiving waters.



Figure 9: Source 9-729 viewed flowing into Coggeshall Cove.

The final source which exceeded the 240 CFU/100 ml benchmark was source 2019-9-800, with a result of 300 CFU/100 ml. This source is a 24” culvert draining a marsh and flowing into the prohibited waters of Allen Harbor in North Kingstown. The flow rate of this source (1.28 cubic ft/s) and the volume of water in the prohibited zone indicate that there is sufficient dilution within the prohibited area such that this source will have no impact on the water quality of the approved portion of the growing area.



Figure 10: Source 9-800 flowing into Allen Harbor.

4. Identification and Evaluation of Pollution Sources

A. Domestic Wastes

Public sewers service only a small portion of the growing area watershed and are located only in the Davisville, Quonset Point area. The Quonset Point WWTF discharges treated effluent to Growing Area 9 (West Middle Bay). All other areas of the watershed are serviced by onsite wastewater treatment systems (OWTSs).

There is one major sanitary discharge and two non-sanitary discharges permitted by the Rhode Island Pollutant Discharge Elimination System (RIPDES) within this growing area. The Quonset Point wastewater treatment facility located on Quonset Point is operated by the RI Economic Development Corporation. The facility has a permitted average monthly flow of 1.78 mg/d of treated effluent. The average flow for 2019 was 0.55 mg/d. The fecal coliform discharge average for 2019 was 2 MPN/100 ml, which is also well below the permit level of 200 MPN/100 ml. There was one (1) violation at the facility during 2019: a daily max BOD violation of 51.4 mg/L on August 15, 2019. The review of Quonset Point WWTF performance data indicated that there were no fecal coliform violations during 2019.

Per NSSP Model Ordinance requirements a prohibited safety zone is established around this outfall. The PLUMES model analysis used to establish the size of the closed safety zone is available for review in the program's permanent files.

B. Stormwater

Stormwater can convey fecal coliform from the watershed into shellfish growing areas, especially in areas with impervious surfaces. Fry's Cove (GA9-3) was reclassified as Prohibited in 2011 in part due to the large amount of runoff from the Quonset Point Airport that enters the Fry's Cove area. Other portions of the watershed, such as the Quonset Point industrial park, have Prohibited zones in the adjacent waters. These prohibited waters serve as dilution zones for fecal coliform discharged from the impervious surfaces to the growing area. The annual review of fecal coliform data collected at routine monitoring stations in the growing area (Figure 3) during all weather conditions demonstrates that runoff is not having a negative effect on the water quality of approved portions of the growing area.

C. Marinas and Mooring Areas

In addition to the large commercial dockage and bulkheads that exist within Quonset Point and Davisville, there is one (1) marina and numerous moorings within Allen Harbor. The entire cove that encompasses Allen Harbor is prohibited to shellfishing

Rhode Island coastal waters are Federally designated as "No Discharge" mandating that the discharge of treated and untreated boat sewage is prohibited (not including greywater or sink water) in these designated areas. These designated areas encompass the entire

West Middle Bay growing area. There is one fixed pump out facility located within Allen Harbor operated by the Town of North Kingstown.

D. Agricultural Waste

Currently there are few agricultural lands within the watershed adjacent to Growing Area 9. A review of RI agriculture operations indicated that there are no commercial animal farms in the watershed. No small-scale ‘hobby farm’ animal operations were noted adjacent to the growing area during the 2019 survey. Therefore, agricultural waste is not a dominant source of fecal coliform to the Growing Area 9.

E. Wildlife

The shores of the West Middle Bay growing area are significantly developed. No appreciable numbers of waterfowl or wildlife were observed during the numerous days of the 2019 shoreline survey.

F. Industrial Wastes

A review of RIPDES permits in the GA9 watershed identified one (1) non-sanitary water release pipe from the V & G Sea products facility. This water release pipe is for rinse water that will not impact the fecal coliform water quality of the growing area.

Sanitary waste from other industrial operations in the Quonset Point and Davisville area are handled by the Quonset Point Wastewater Treatment Plant. The Quonset WWTF discharges treated effluent into waters of Growing Area 9, just north of GA7. A review of Quonset Point WWTF performance data (echo.epa.gov) indicates that there were no fecal coliform violations during 2019. Per NSSP Model Ordinance requirements a prohibited safety zone is established around this outfall. The PLUMES model analysis used to establish the size of the closed safety zone is available for review in the program’s permanent files.

G. Poisonous and Deleterious Substances

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM’s Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program’s HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Growing Area 9 (East Middle Bay) due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk. This is corroborated by a ‘mussel watch’ study which had a monitoring station in GA9. A long-term study of contaminants (metals and organics) in waters throughout the country is being done by NOAA National Status and Trends called the Mussel Watch Program (Kimbrough et al. 2008). Monitoring was completed in Rhode Island at four stations using mussels as the surrogate species. Of the four RI stations, the closest is Patience Island (station NBPI) which is within the boundaries of GA9. None of the metals and organic chemical compounds analyzed at this GA9 location were above the FDA action levels outlined in the 2007 NSSP Guide for the Control of Molluscan Shellfish.

Table 2: NOAA mussel watch metals and organic compound results. Monitoring site NBPI (Patience Island) is located in GA9 (from Kimbrough et al., 2008)

APPENDIX 2: RESULTS BY STATE
RHODE ISLAND (RI)



Regional (r) Mussels (M)
 ● Medium
 ● High

Status (s) National Status
 ● Medium
 ● High

Trend (t) National Trend
 ▼ Decreasing
 ▲ Increasing

Zebra Mussels (ZM)
 ● Medium
 ● High

Oysters (O)
 ● Medium
 ● High

Concentrations derived from 2004-2005 data.
 Markers represent the Regional Species Characterization (r), National Characterization (s) and National Trends maps (t).

Site	Latitude	Longitude	General Location	Location
NBDI	41.6048	-71.3052	Narragansett Bay	Dyer Island
NBPI	41.6523	-71.3567	Narragansett Bay	Patience Island
NBDU	41.5013	-71.3928	Narragansett Bay	Dutch Island
BIBI	41.1982	-71.5922	Block Island Sound	Block Island

METALS (ppm)

Site	Spec	AS	r	s	t	CD	r	s	t	CU	r	s	t	HG	r	s	t	NI	r	s	t	PB	r	s	t	SN	r	s	t	ZN	r	s	t
NBDI	M	9.9				0.94				9.7				0.12				1.1				2.9	●	●		0.16				132			
NBPI	M	8				0.4				10				0.06				0				0.82				0			48			▼	
NBDU	M	13	●	●		1				8.4			▼	0.12				1.8				2				0			117				
BIBI	M	11	●	▼		1.3				8.9				0.12				1.8				1.4				0			150	●			

ORGANICS (ppb)

Sites	Spec	Butyltins	r	s	t	Chlordanes	r	s	t	DDTs	r	s	t	Dieldrins	r	s	t	PAHs	r	s	t	PCBs	r	s	t
NBDI	M	50		●		8				26				6.4				1540	●	●		239	●		
NBPI	M	12			▼	6.1				27				20	●	●	▼					141	●		
NBDU	M	14			▼	4.5				14				4.6				520				102			
BIBI	M	13				1.8				4.3			▼	0.87				285				24			

5. Hydrographic and Meteorological Characteristics

A. Tides

Tides in Rhode Island are semi-diurnal (having a cycle of approximately one-half of a tidal day or 12.84 hours) characterized by two similar high waters and two similar low waters each tidal day. A semi-diurnal tide has two flood and two ebb periods each day with two tidal maxima and two tidal minima each constituent day.

The shoreline survey was scheduled to coincide with ebb and/or low tide, which is the most opportune time for observing stormwater outfalls that may otherwise be hidden by tidal water. Additionally, pollution effects such as runoff are generally more noticeable during low tide. Sampling of streams and pipes during low tides should represent actual stream flows rather than the retreating tidal waters that they may receive.

B. Rainfall

In Rhode Island there are normally no seasonal patterns in the frequency and amounts of precipitation during the year, however two major storm patterns exist. Storms that occur between October and May are primarily extra-tropical cyclones. The most famous are the "nor-easters:" low-pressure systems that typically develop off the North and South Carolina coasts and move northeast along the Atlantic seaboard, occasionally colliding with colder and drier air (from Canada) in the New England region. This results in the development of heavy rain and/or snow. These storms are more widespread in their range. The second type of storm, occurring between June and October, are primarily tropical cyclones. The biggest storms are hurricanes, which directly affected Rhode Island 9 times during the last 350 years (RI Emergency Management Agency). In the summer, most precipitation results from thunderstorms and smaller convective systems. These typically produce short-duration high-intensity precipitation events and are more localized than nor-easters.

Growing area response to these precipitation events varies according to storm duration, storm intensity, and watershed characteristics such as land use, vegetative cover, and soil characteristics. Changes in land use and vegetative cover are typically accompanied by increases in impervious areas. Of particular concern for the growing area is the close proximity of impervious surfaces to stream channels. This allows for the rapid and efficient transport of runoff of concomitant pollutants, including fecal coliform bacteria, to river and stream channels that ultimately drain to the growing area.

The RI Shellfish Program criteria for wet weather conditions is a minimum of 0.5-inches of precipitation within a 24-hour period in the prior 7 days. The wet and dry weather conditions described for this survey are based on the above criteria.

The 2019 shoreline survey dates for West Middle Bay were July 15, 16, 17, 29, 30, and 31; and October 24. The following rainfall data was observed at the NOAA weather station at TF Green State Airport in Warwick, RI. Highlighted rows indicate days in which surveying was conducted, with yellow representing dry weather days and blue representing wet weather days.

Table 3: July 2019 rainfall data; survey dates highlighted.

Date	Total Precipitation (inches)	Average (°F)	Max (°F)	Min (°F)
7/1/2019	0	72.5	84	61
7/2/2019	0	75	82	68
7/3/2019	0	77	88	66
7/4/2019	0	78	90	66
7/5/2019	0	74	82	66
7/6/2019	0.02	81	89	73
7/7/2019	0	71.5	80	63
7/8/2019	0	70.5	81	60
7/9/2019	0	75	88	62
7/10/2019	0	76.5	89	64
7/11/2019	0.06	76	83	69
7/12/2019	1.01	80	89	71
7/13/2019	0	78	86	70
7/14/2019	0	79.5	90	69
7/15/2019	0	75	84	66
7/16/2019	0	75	87	63
7/17/2019	0.39	81.5	91	72
7/18/2019	0.16	71	78	64
7/19/2019	0	77	89	65
7/20/2019	0	85.5	94	77
7/21/2019	0	87	96	78
7/22/2019	0.81	77	84	70
7/23/2019	1	67.5	71	64
7/24/2019	0.02	73	82	64
7/25/2019	0	73.5	83	64
7/26/2019	0	72.5	82	63
7/27/2019	0	71.5	79	64
7/28/2019	0	77	90	64
7/29/2019	0	82.5	91	74
7/30/2019	0	82	93	71
7/31/2019	0	81.5	92	71

Table 4: October 2019 rainfall data; survey dates highlighted.

Date	Total Precipitation (inches)	Average (°F)	Max (°F)	Min (°F)
10/1/2019	T	65.5	73	58
10/2/2019	0.08	68.5	83	54
10/3/2019	0.09	52.5	56	49
10/4/2019	0.03	54	64	44
10/5/2019	0	49.5	60	39
10/6/2019	T	53	68	38
10/7/2019	0.19	69.5	79	60
10/8/2019	0.01	58.5	62	55
10/9/2019	0.97	54	56	52
10/10/2019	0.1	53.5	56	51
10/11/2019	0.04	54	56	52
10/12/2019	0	54.5	58	51
10/13/2019	0	58	68	48
10/14/2019	T	59	68	50
10/15/2019	0	52.5	64	41
10/16/2019	1.38	50.5	63	38
10/17/2019	0.46	56	61	51
10/18/2019	0	52	61	43
10/19/2019	0	49	60	38
10/20/2019	T	48	60	36
10/21/2019	T	56.5	66	47
10/22/2019	0.16	54	61	47
10/23/2019	0.38	57.5	69	46
10/24/2019	0	53.5	67	40
10/25/2019	0	54	64	44
10/26/2019	T	55	63	47
10/27/2019	1.4	52	56	48
10/28/2019	T	53.5	58	49
10/29/2019	T	53.5	57	50
10/30/2019	0.21	57.5	65	50
10/31/2019	0.15	65	70	60

C. Winds/Climate

Rhode Island’s climate may be summarized as having an equitable distribution of precipitation throughout the four seasons and large ranges of temperature, both daily and annually, as well as variability in the same season year-to-year and considerable diversity of the weather over short periods of time. These varying conditions are greatly influenced across the state by the proximity to Narragansett Bay or the Atlantic Ocean and by elevation and nature of the local terrain. Day to day variety is the norm with no particular regular or persistent rhythm to the changes in weather other than a tendency to a roughly twice-weekly alternation from fair weather to cloudy or stormy weather.

Weather averages in Rhode Island are not very useful for important planning purposes due to the large variation in daily weather patterns. However, the following averages can be used for general understanding of the area’s climate.

The mean annual temperature ranges from 48°F to 51°F with the higher mean temperature more representative of the areas of Narragansett Bay. The average daily minimum temperature in January and February is 25°F in coastal sections.

Daily winds are variable throughout the year, but a general pattern of NW winds in winter and SW winds during summer prevails. Along the coast there is a daily land-breeze, sea-breeze patterns during the summer months.

Precipitation is evenly distributed throughout the year, with annual averages of 42 to 46 inches and the southeastern bay area tending towards 40 inches. Average yearly snowfall along the shoreline is about 20 inches, however the region is known to have years in which snowfall totals can be significantly less than average as a result of milder winters. Total precipitation averages around 3 to 3.5 inches per month regardless of season, but with the lesser amounts typically in the period between May and July.

D. River Discharges

There is one major fresh water river that discharges to the West Middle Bay growing area. The Hunt River merges with the Potowomut River at the dam at Forge Road on the town line between Warwick and North Kingstown. The USGS has a gauge station (USGS station 01117000) at this location reporting an average discharge of 47.4 cfs based on observations made during 1941 to 2019. The mean flow during the past ten years (2010 to 2019; 47.3 cfs) was not significantly different than the long-term flow of 47.4 cfs.

6. Water Quality Studies

A. Overview

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at thirteen (13) monitoring stations throughout the growing area (Figure 3). Three of these stations are in prohibited areas, while the other 10 are in the approved portion of the growing area.

Samples are collected 1-2 feet below the water surface (using 4-ounce sterile Nalgene bottles) after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012,

RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics for GA4 were analyzed by the mTec method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

B. 2019 Review and Statistical Summary of Growing Area 9

HIGHLIGHTS

- * Sampled 5X during 2019 and once during January 2020.
- * Statistics represent combined wet (n= 17) and dry (n= 13) weather data collected between 6/17/2015 to 1/7/2020.
- * All samples analyzed by the MTEC method.
- * Data run 2/13/2020.
- * All approved stations in compliance.

COMMENTARY

The West Middle Bay (Growing Area 9) was sampled six times during the 2019 season (5X during 2019 and once during January 2020), meeting the minimum systematic random sampling guidelines for approved areas. Statistics were calculated from the most recent 30 samples which were collected under both wet (n= 17) and dry (n= 13) weather conditions.

The Potowomut River (stations 9-13 and 9-5) has elevated fecal coliform levels during wet weather. A TMDL study for fecal coliform impairment in the growing area is scheduled for 2023. Station 9-13 near the freshwater end of the Potowomut River was established in 2007 to evaluate whether that area of was suitable for approved harvest of shellfish. The 2019 statistical evaluation indicated that the freshwater end of the Potowomut River (station 9-13) met, but nearly exceeded the 90th percentile variability criteria and that shellfish harvest should remain prohibited for that region. ‘Sentinel station’ 9-5 at the mouth of the Potowomut River and at the transition from prohibited to approved waters continues to meet criteria for approved waters and should remain approved for shellfish harvest. The 2019 statistical review indicated that all approved stations in the growing area were in program compliance and that the area is properly classified.

RECOMMENDATIONS

- * Maintain closure of upper Potowomut River.
- * Continue to monitor Potowomut River (stations 9-13 and 9-5) to follow changes in water quality.
- * No other actions recommended based on ambient monitoring results.

RIDEM SHELLFISH GROWING AREA MONITORING: GA9

Recent 30 all weather.

(6/17/2015 to 1/7/2020; all mTEC, 17 wet and 13 dry weather sets of samples)

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA9-1	P	30	2.1	2.7
GA9-2	A	30	2.0	2.4
GA9-3	P	30	3.1	9.1
GA9-4	A	30	2.7	6.9
GA9-5	A	30	3.9	18.0
GA9-6	A	30	2.6	5.6
GA9-7	A	30	2.1	2.7
GA9-8	A	30	2.1	2.6
GA9-9	A	30	2.0	2.7
GA9-10	A	30	2.0	2.4
GA9-11	A	30	2.0	2.4
GA9-12	A	30	2.0	2.5
GA9-13	P	30	6.0	27.0

C. Sampling Plan and Justification

Most of Growing Area 9 is classified as ‘Approved’ and the microbiological water quality of the area is potentially influenced by non-point sources of pollution. As such, the area is monitored six (6) times per year under all weather conditions as recommended in the NSSP Model Ordinance. The systematic random sampling strategy is used, with random sample dates selected during January of each year. Per NSSP guidance, the geomean and 90th percentile values of the most recent 30 observations are used for statistical evaluation.

A random sampling plan for the growing area is scheduled yearly, with a statistically representative cross section of all meteorological, hydrographic, and/or other pollution events that may affect water quality and subsequent shellfish contamination. A reasonable attempt is made to collect samples on the pre-established days and sampling is rescheduled should sampling conditions delay sampling on the pre-established date.

Water quality monitoring station locations (Figure 3) and number of stations were selected to be representative of all conditions in the growing area. Sentinel stations (i.e.,

station 9-5) are located at the borders of Prohibited areas to verify that these Prohibited zones are protective of water quality in the Approved areas.

D. RIDEM TMDL Studies

A TMDL for bacteria contamination within the Hunt River, which was approved by EPA in 2001, and updated in the state-wide report in 2011. A TMDL for the Potowomut River is scheduled for 2023. The Hunt River comprises most of the freshwater portion and the Potowomut River comprises most of the tidal portion of the Hunt / Potowomut River. The 2001 TMDL for the Hunt River identified fecal coliform as the pollutant of concern and further demonstrated that fecal coliform was elevated during wet weather (DEM, 2001). The largest wet weather source of bacteria to the watershed is stormwater runoff. Most areas of the Hunt River met the ‘class B waters’ fecal coliform standard of 200 cfu/100 ml during dry weather but exceeded this standard during wet weather (DEM, 2001). Fecal coliform in the Hunt River and tributaries was increased approximately 9.6-fold during wet weather compared to dry weather (DEM, 2001) clearly showing the impact of wet weather on the fecal coliform water quality of the river. The prohibited zone within the tidal Potowomut River offers sufficient dilution to reduce this fecal coliform loading prior to reaching the Approved waters of GA9. This is demonstrated by the 2019 statistical results (geometric mean of 3.9 cfu/100 ml and 90th percentile of 18.0 cfu/100 ml) at sentinel station 9-5 located on the Prohibited line at the mouth of the Potowomut River. Compliance with NSSP standards at this station demonstrates adequate dilution before the waters of the Potowomut River reach the growing area.

7. Interpretation of Data

A. Effects of Meteorological and Hydrographic Conditions

As described above, fecal coliform loading to the growing area via the Hunt/Potowomut River increases dramatically during wet weather. A comparison of GA9 monitoring station data during wet (>0.5” rain in prior 7 days) versus dry weather showed that all Approved stations met NSSP criteria for direct consumption of shellfish even under the scenario of all wet weather data (Table 5). Station 9-13 (Prohibited classification) closest to the freshwater portion of the Hunt / Potowomut River showed the influence of wet weather (Table 5). Station 9-5 (Approved classification), located at the mouth of the Potowomut River is a sentinel station that met NSSP fecal coliform criteria during both wet and dry weather (Table 5). This clearly demonstrates that all Approved stations meet NSSP fecal coliform criteria even under an all wet weather scenario and that the area is properly classified.

Table 5: Comparison of fecal coliform concentrations during wet (>0.5" in 7 days prior to sampling) versus dry weather at GA9 monitoring stations. Results are in cfu/100 ml. Recent 30 samples during wet (7/13/2011 to 6/4/2019) and dry (7/8/2008 to 10/8/2019) weather used to calculate compliance statistics.

Station 9-	Classification	Wet Weather		Dry Weather	
		Geometric Mean	90th Percentile	Geometric Mean	90th Percentile
1	P	2.1	2.7	2.2	4.7
2	A	2.1	3.1	2.1	3.0
3	P	3.5	14.1	2.9	6.3
4	A	2.4	5.8	2.3	3.6
5	A	4.2	21.9	3.2	8.7
6	A	2.4	4.7	2.3	3.9
7	A	2.2	3.8	2.0	2.0
8	A	2.0	2.4	2.2	3.0
9	A	2.1	3.0	2.1	2.9
10	A	2.1	2.6	2.4	4.3
11	A	2.0	2.0	2.1	2.6
12	A	2.1	2.7	2.1	2.6
13	P	8.4	68.4	6.6	40.9

8. Recommendations

A. Monitoring Schedule

The current monitoring schedule is adequate for tracking water quality changes and maintaining correct classification.

B. Comments

Water quality statistical evaluations indicate that the area conforms to NSSP requirements as an approved growing area during both wet and dry weather. There are no recommendations for change in classification at this time.

C. Legal Descriptions

Based on regular RIDEM Shellfish Program monitoring data and the data acquired during this 12-year shoreline survey, it is recommended that the existing legal description of the growing area be maintained.

Shellfishing Prohibited:

Shellfishing is Prohibited in the following areas of GA9:

GA9-1 Allen Harbor, west of a line from the Rhode Island Department of Environmental Management range marker on the southeastern most extremity of Calf Pasture Point, to the Rhode Island Department of Environmental Management range marker on the

northeastern most extremity of Spink Neck, including Allen Harbor, Little Allen Harbor, and the entrance channel in their entirety.

GA9-2 The waters in the vicinity of Piers #1 and #2 at the Davisville depot that are south of a line from the northeast corner of Pier #2 (the more northerly pier at the Davisville depot) to nun buoy "16" and north and west of the intersection of the lines from the Rhode Island Department of Environmental Management range marker located on the bulkhead at approximately 300 feet south of Pier #1 (the more southerly pier at the Davisville depot) to nun buoy "12", and a line from the northeastern end of the bulkhead at Quonset State Airport through nun buoy "16".

GA9-3 Fry's Pond in its entirety and all waters in so called Fry's Cove west of a line from the most southern point of the wooden bulkhead at the southeast corner of the Quonset-Davisville Commerce Park to the inside north-west corner of the stone bulkhead containing the Quonset State Airport runways.

GA9-4 Included in description of closure number GA7-1

GA9-5 The waters of the Potowomut River west of a line from the Rhode Island Department of Environmental Management range marker located on Marsh Point on the northern shoreline to the Rhode Island Department of Environmental Management range marker located on Pojac Point on the southern shore.

Other inland waters adjacent to the offshore waters of GA14 that are inland of the program's 'green line' as described in the annual 'Notice of Polluted Shellfish Grounds' are also classified as Prohibited as shown on reference maps and as also described individually.

9. Literature Cited:

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**GA10
Point Judith & Potters Pond
2019 Annual Update**

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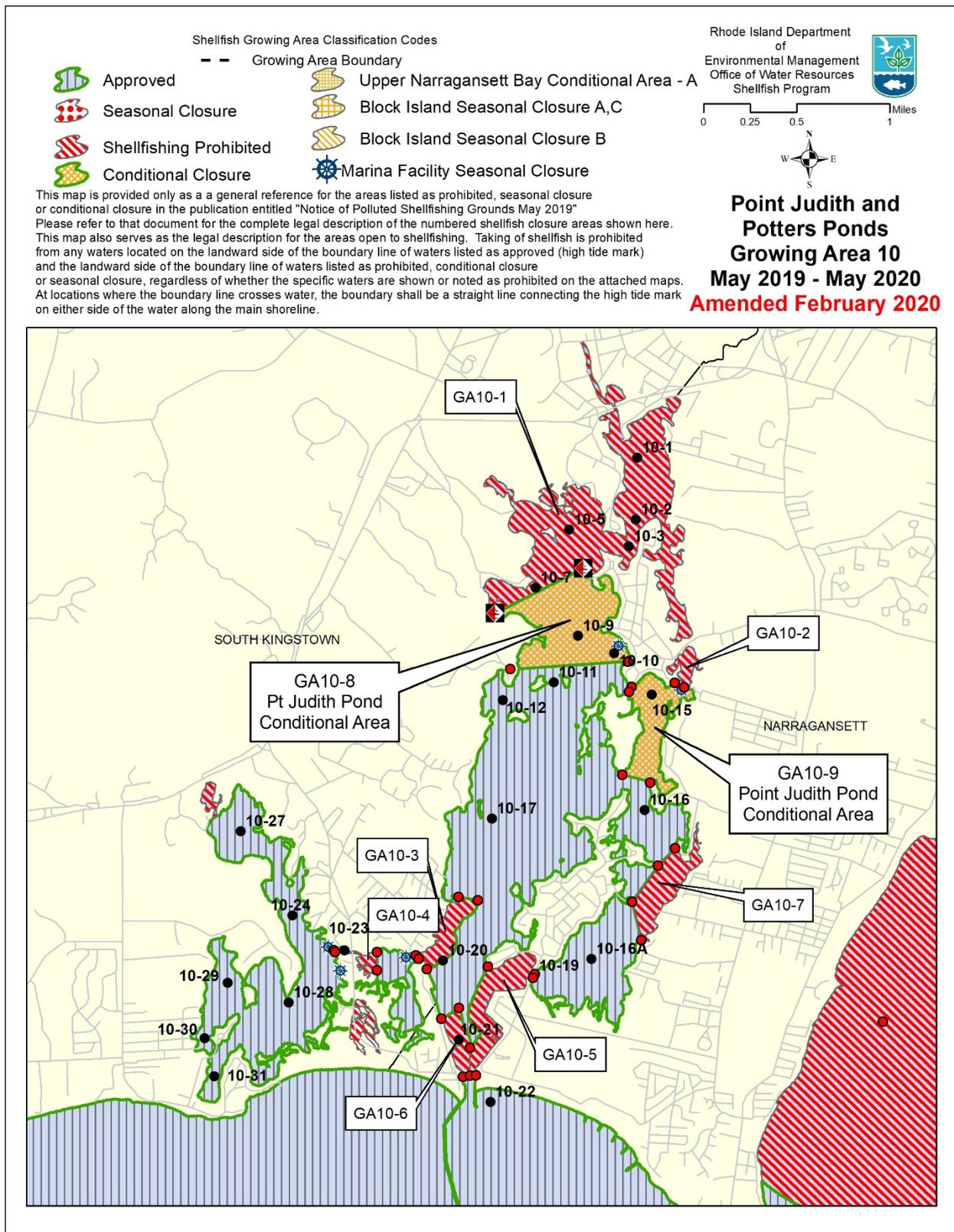
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1. Introduction

12-year sanitary shoreline surveys of the Point Judith Pond and Potters Pond Growing Area (GA10; Figure 1) were completed in 2002 and 2011. Triennial surveys were completed in 2005, 2008, 2014 and 2017. During the 2011 12-year survey a total of ninety-seven (97) actual or potential sources were identified. A total of forty-seven (47) were not actively flowing at the time of the shoreline survey with the remaining fifty (50) having flows warranting sampling. All sources in which flow was observed were sampled. During the 2017 triennial survey twenty-nine (29) potential pollution sources were sampled. The 2019 survey of this growing area was an annual update.

Figure 1. 2019-2020 Shellfish Classification Map of GA10



2. 2019 Shoreline Survey

The 2019 shoreline survey annual update of GA10 was conducted on May 15th, August 26th, September 9th, and December 16th, 2019 by DEM Shellfish Program staff. In 2019 sixteen (16) sources were re-sampled, six (6) of which flow was observed were into receiving waters currently classified as Approved while the remaining ten were into Prohibited waters. In 2019, three (3) of the sixteen (16) sources had no flow at the time of sampling, and the remaining thirteen (13) were sampled with results shown in Table 1. Of the sources sampled during the 2019 reevaluation, none of the thirteen (13) flowing sources had results greater than 2,400 cfu/100ml necessitating follow up sampling for this annual review. Fecal coliform concentrations decreased at these sources in 2019, however they should be reevaluated in the 2020 triennial update. Special attention was paid towards the sources in Bluff Hill Cove and Champlin Cove. Figure 2 indicates the location of potential pollution sources in GA10.

Rainfall proceeding each day of the 2019 GA10 shoreline survey is summarized below:

May 15, 2019	3 days since 1.70" rain at Westerly Airport (KWST)
August 26, 2019	8 days since 1.71" rain at Westerly Airport (KWST)
September 9, 2019	13 days since 0.96" rain at Westerly Airport (KWST)
December 16, 2019	2 days since 1.36" rain at Westerly Airport (KWST)

Figure 2. 2019 Pollution Sources in GA10 with Routine Monitoring Stations

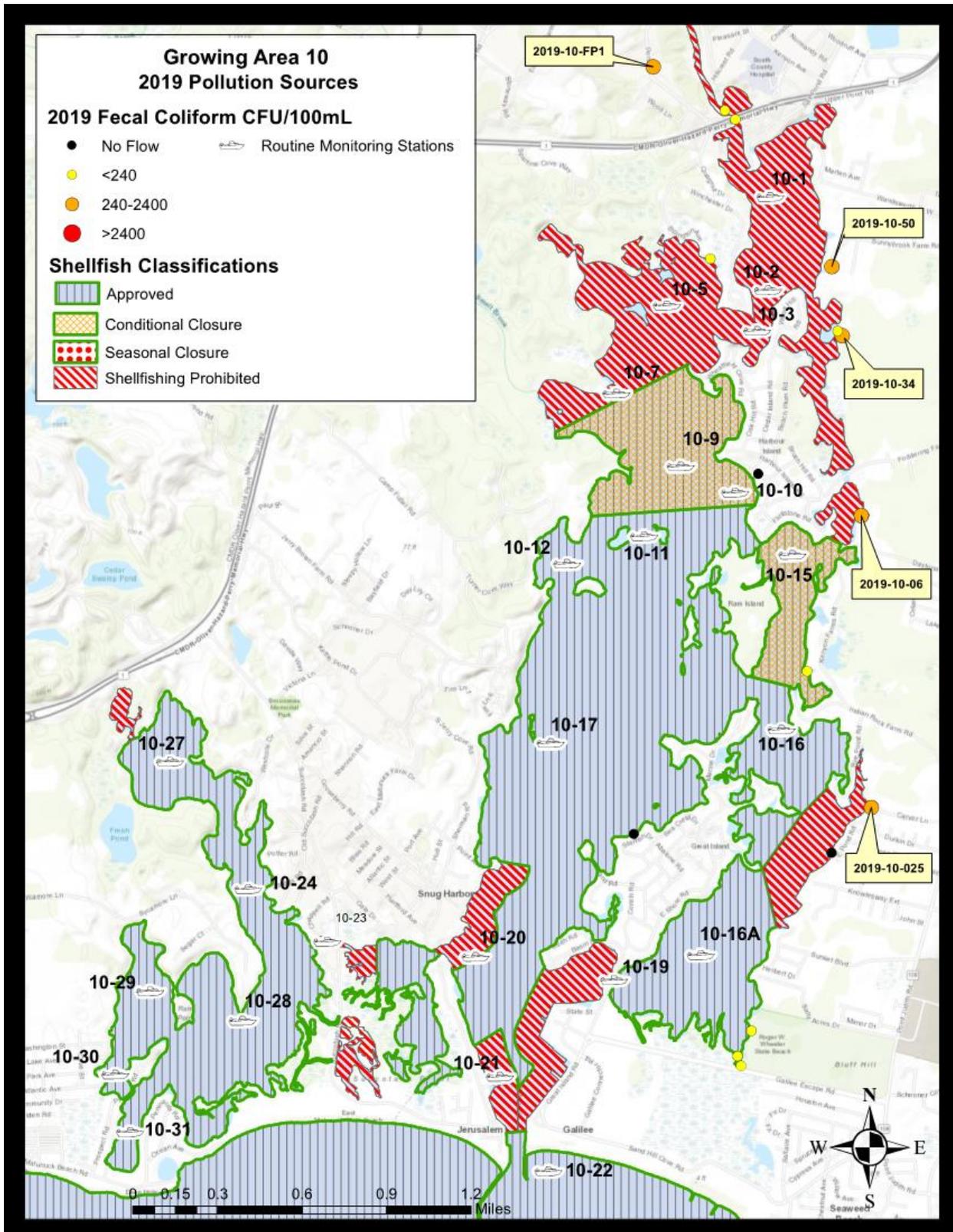


Table 1: 2019 Summary of Pollution Sources in GA 10; sources >240 cfu/100 ml in yellow highlight.

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
2019-10-06	8/26/2019	41.4081	-71.4903	Stream entering Champlin Cove	Prohibited	A	D	640	N/A
2019-10-011	8/26/2019	41.4102	-71.4973	RCP outfall-near Cedar Island Rd, Harbor Island, Narr	Approved	P	D	NS	NF
2019-10-018	8/26/2019	41.3917	-71.5058	Stream draining cove near Starfish Drive-Great Island, Narr	Approved	P	D	NS	NF
2019-10-21A	5/15/2019	41.3797	-71.4989	Culvert closest to campground	Approved	A	D	31	N/A
2019-10-21B	5/15/2019	41.3808	-71.5052	Culvert closest to boat ramp	Approved	A	D	5	N/A
2019-10-025	8/26/2019	41.3931	-71.4896	Two PVC pipes, cove east of Rye Point, Narr	Prohibited	A	D	710	0.00144
2019-10-33	9/9/2019	41.4176	-71.4919	Stream entering Long Cove, Narr	Prohibited	A	D	<100	0.85
2019-10-34	9/9/2019	41.4174	-71.4916	Stream entering Long Cove, Narr, merges with 10-33 before entering cove	Prohibited	A	D	1400	Trickle
2019-10-36	9/9/2019	41.4213	-71.5006	Stream entering Billington Cove	Prohibited	A	D	<100	0.547
2019-10-43A	9/9/2019	41.429	-71.4996	Saugatucket River	Prohibited	A	D	200	64.6
2019-10-50	9/9/2019	41.4209	-71.4923	Stream entering east side of Upper Pond, Narr	Prohibited	A	D	300	1.02

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
2019-10-62	8/26/2019	41.3907	-71.4923	RCP flared end outfall, Pondview Ave, Narr.	Prohibited	P	D	NS	NF
2019-10-100	5/15/2019	41.3816	-71.4978	Stream flowing from road at back end of Fishermans Memorial Campground	Approved	A	D	33	0.1411
2019-10-200	8/26/2019	41.4001	-71.494	Culvert draining pond at kenyon Farm	Approved	A	D	100	0.0282
2019-10-RP1	12/16/2019	41.4285	-71.4989	Instream taken Under Rt.1 overpass	Prohibited	A	D	200	N/A
2019-10-FP1	12/16/2019	41.4312	-71.5045	Stream from farm flowing under Pond Rd	Prohibited	P	I	1000	N/A

IS = In stream sample NS = Not sampled NF = No flow CNL = Could not locate NA = Measurements not taken

*Highlighted sources >240 CFU/100ml.

A. Description of Sources

No Sources sampled during the 2019 survey exceeded 2,400 cfu/100 ml (Table 1). Five (5) sources sampled during the 2019 survey exceeded 240 cfu/100 ml. A brief description of these sources is below.

Source 2019-10-06 is a small stream entering the Prohibited waters of inner Champlin Cove. On the day of sampling (8/26/2019) the stream had a fecal coliform concentration of 640 cfu/100 ml, but the stream had low flow.

Source 2019-10-34 is a small stream draining into Long Cove in Pt. Judith Pond. This source had bacteria results of 1,400 cfu/100 ml, however the flow was only a trickle (<.001 cfs) and the stream flows into prohibited waters. There is adequate dilution of this source in prohibited waters. Due to these factors DEM Shellfish staff conclude this source is not impacting the approved waters of the growing area.

Figure 3. Source 2019-10-34, a small stream entering Long Cove, Narragansett.



Source 2019-10-25 is two small PVC pipes buried in the hillside above the pond. 2019 sampling indicated that both pipes had fecal coliform levels of 710 cfu/100ml. The flow was only slightly greater than a trickle (.001 cfs). This source flows into the newly established (2018) prohibited waters of Bluff Hill Cove along the eastern shoreline of Pt Judith Pond. This area was reclassified due to the elevated sources identified along this shoreline of which this source is one so identified. This prohibited area is protective of this and the other sources and the details as to the status of attempts by RIDEM and the town to identify causes for these elevated bacteria results is ongoing and the reports are maintained in the program's permanent files in addition to the discussion in Section B. This area will remain classified as prohibited until such time as the causes of elevated bacteria levels are identified and abated if possible.

Figure 4. Source 2019-10-50



Source 2019-10-50 is a small stream (1.02 cfs) that flows into the Prohibited waters of Upper Pt. Judith Pond. This source had a fecal coliform concentration of 300 cfu/100 ml on 9/9/2019. This source is approximately 1.2 k (0.75 miles) from the Conditionally Approved waters of GA10. There is sufficient dilution within the Prohibited zone so that this source is not negatively impacting the Conditionally Approved waters of GA10.

B. Saugatucket River

The Saugatucket River (source 2019-10-43A) is the largest source of freshwater to Pt. Judith Pond. Samples from the 2002 12-year survey and the 2005 triennial update both had results of 1,100 MPN with a flow rate of 120 m³/100 ml and results from the 2011 sampling yielded a result of 2,300 m³/100 ml. It appears the Saugatucket River continues to be a significant impact to the upper waters of Pt. Judith Pond. In 2019 both samples of the Saugatucket were taken during dry weather and results were 200 cfu/ 100ml. A TMDL for the river was completed in 2008 which made numerous recommendations to address the bacteria impairments within this river. Currently there are multiple offices within RIDEM that are investigating coliform bacteria sources identified in this TMDL. The elevated fecal coliform concentration and the relatively large flow rate indicate that the Saugatucket River is likely the largest source of fecal coliform loading to GA10 during wet weather. Both samples of the Saugatucket River taken during dry weather during 2019 showed fecal coliform results of 200 cfu/ 100ml.

In December 2019 DEM Shellfish staff investigated a farm pond and stream that flows into the prohibited waters of the Saugatucket River. Samples from this stream (Source 2019-10-FP1) collected on 12/16/2019 which was two days after 1.36" rain at westerly Airport, had results of

1,000 cfu/100ml. This stream flows into the Prohibited waters of the Saugatucket River and may be contributing to the elevated fecal coliform observed in GA10 during 2019.

C. Bluff Hill Cove

In 2018 a reclassification of the Bluff Hill Cove area of Pt. Judith Pond (the southeast corner, near water quality monitoring station 10-16A in Figure 1) occurred in the form of a downgrade from Approved to Prohibited shellfishing waters. This change was due to elevated fecal coliform bacteria results from multiple shoreline sources and a resultant increasing and variable water column fecal coliform result in that area.

In the summer of 2019, the town of Narragansett conducted an investigation of possible illicit discharges into the storm drain systems in the area at the request of RIDEM. The results of this investigation found that there was no indication of the presence of an illicit discharge into the Bluff Hill Cove storm drainage system and that dry weather flow is a result of high groundwater levels in the area. The town of Narragansett has created a control plan that includes public outreach to educate the public on the issue of stormwater runoff and fecal coliform pollution and to inform residents of ways to reduce their impact. Proposed mitigation strategies in the plan include a vegetative buffer program including tree planting to reduce runoff and improve filtration before the runoff reaches Pt. Judith Pond, and a wet weather control plan to identify source(s) of elevated bacteria counts in the stormwater system.

DEM Shellfish Program staff will continue to monitor the receiving waters to evaluate the effectiveness of these remediation efforts on the water quality of Bluff Hill Cove. The Bluff Hill Cove prohibited zone will remain in effect until remediation efforts are completed and water quality statistics demonstrate that the area reliably meets NSSP criteria for Approved waters.

D. 2019 Emergency and Precautionary Closures

Rhode Island had an unusually wet year in 2019. The Westerly, R.I. weather station (KWST) recorded 59 inches of rain, compared to an annual average of 43.5 inches. Routine random sampling of Growing Area 10 coincided with wet weather (2 days after 3.32 inches) on July 25th, leading to an emergency closure of Pt. Judith pond, and recall of all harvested shellfish from those waters. Following this event, RIDEM enacted four more precautionary closures in anticipation of large rainfall events through the remainder of year. Samples were taken following these rain events and precautionary closures, in which coliform bacteria levels were elevated beyond the acceptable threshold. Samples were taken by RIDEM Shellfish program staff as well as the East Coast Shellfish Growers Association. East Coast Shellfish Growers Association took samples on the eastern shore of Pt Judith Pond 12 hours after 1.66" of rain recorded in Westerly (KWST), with results ranging from 100 to 820 cfu/100 ml. Due to the above described elevated coliform bacteria results throughout 2019, a plan has been created to reclassify the areas impacted into conditionally approved shellfish harvest areas for the 2020 season. This reclassification became effective in February of 2020. DEM Office of Water Resources staff will continue to monitor and investigate these waters and surrounding areas for possible pollution sources.

E. Poisonous and Deleterious Substances

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Growing Area 10 (Pt. Judith and Potter Ponds) due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

3. Marinas and Moorings

There are numerous recreational boating facilities within the growing area that have the potential to have negative impacts upon water quality, and for those marinas that do have that potential an area protective of shellfish waters has been established for the marina proper and the adjacent waters. As of 2017 there are four pumpout facilities servicing the numerous marinas, two at the head of Point Judith Pond at Ram Point and the other two at the connector channel between the two ponds. Both ponds are within the states no-discharge zone, making the discharge of marine sanitation devices illegal.

The Port of Galilee in the Town of Narragansett is the major commercial fishing center in Rhode Island. The port is located on the eastern side of Point Judith Pond immediately north of the breachway. There are also commercial fishing boats harbored in Snug Harbor immediately south of High Point in South Kingstown.

The areas immediately surround these ports are closed to shellfishing. The potential impacts from the existing commercial docks and marinas has been evaluated and waters adjacent to these facilities are within the closed prohibited zones providing adequate protection in the case of any discharges associated with marine vessels. Details of this analysis can be found in the program document entitled "Evaluation of Waters Adjacent to Marinas – Marine Dilution Analysis Background June 2017."

4. Wastewater Treatment Facilities

There are no wastewater treatment facilities that discharge directly into either Point Judith Pond or Potters Pond. There are six (6) RIPDES permitted discharges into the harbor area in Galilee. They are all water release pipes associated with fish processing and distribution plants and discharge into waters that are currently classified as prohibited providing sufficient dilution prior to mixing with adjacent approved shellfish waters.

5. Water Quality Studies

The Shellfish Growing Area Monitoring program is part of the state of Rhode Island's agreement with the United States Food and Drug Administration's National Shellfish Sanitation Program (NSSP). The purpose of this program is to maintain national health standards by regulating the interstate shellfish industry. As part of this agreement, the state of Rhode Island is required to conduct continuous bacteriological monitoring of the shellfish harvesting waters of the state in order to maintain certification of these waters for shellfish harvesting for direct human consumption.

Surface water samples are collected by the RIDEM OWR Shellfish Program staff. A description of field conditions is recorded, which includes overall tidal stage, wind direction and speed, number of days since last rain and the rainfall total, the status of conditional areas (open or closed), any important observations such as flocks of birds or algae blooms, and water temperature and collection time at each sampling station. All samples are analyzed by the RIDOH Water Microbiology Laboratory for the presence of fecal coliform bacteria. RIDOH uses the procedures as prescribed by the American Public Health Association in "Standard Methods for the Examination of Water and Wastewater" (APHA, 1995) for the standard fecal coliform membrane filtration method (sm48 mTEC) utilized exclusively since August 2012 and/or the multiple tube fermentation test (sm01 MPN) method utilized prior to August 2012. Results from the different analytical methods are being co-mingled and statistical analysis is being performed according to the "SOP MPN to mTEC Transition" document dated August 2012 (RIDEM, 2012). The procedure for water sample holding times and temperature control for the sm48 and sm01 methods are described in the RI DEM Shellfish Growing Area Monitoring Program Standard Operating Procedures (copy in the Program's permanent file).

The results of all bacteriological monitoring – whether collected as part of the routine bacteriological monitoring program or sanitary survey program – are evaluated by RIDEM Shellfish staff as they are received from the RIDOH. Any unusual or exceptionally elevated values are immediately evaluated to determine the need for additional sampling and/or investigation.

The fecal coliform water quality in Pt. Judith and Potter Ponds (GA10) is monitored at 24 stations in the growing area (Figure 1). The growing area is sampled six times per year under a systematic random sampling strategy following NSSP guidance for growing areas not affected by point sources.

6. GA10 Annual Statistical Summary

A. HIGHLIGHTS

2019 Review and Statistical Summary of Growing Area 10

- * Sampled 13X during 2019 while the area was in both open (n=8) and closed status (n=5).
- * Statistics represent recent 30 samples collected when the area was open during both wet (n=17) and dry (n=13) weather during 7/17/2015 to 12/16/2019.
- * GA10 management changes effective 2/1/2020:
 - All stations: emergency rain closure (2.5", 7-day closure)
 - Northern Pt. Judith Pond (stations 10-9, 10-10, 10-15): reclassified as conditionally approved with 1.4" rain, 7-day closure.
- * All samples analyzed by the MTEC method.
- * All approved stations in compliance.
- * Data run 2/12/2020.

B. COMMENTARY

Pt. Judith and Potter Ponds (GA10) were sampled 13X during 2019. Eight sets of samples were routine samples collected on random dates and five sets of samples were targeted samples collected during wet weather to characterize the response of GA10 to elevated rainfall. Only the samples collected on routine-randomly selected dates when the area was in the open status were used in calculation of compliance statistics.

Coastal southern RI received an extraordinary amount of rain during 2019. A total of 59.1" of precipitation was received at Westerly Airport (NOAA weather station KWST) during 2019 which is 15.9" greater than the mean annual rainfall of 43.2". Much of this additional rain fell during the summer months. 17.5" of rain fell during June, July and August of 2019; this was 6.9" of added rain compared to the level of 10.6" usually received over those summer months. Routine sampling on 7/25/2019 (2 days after 3.32" rain at Westerly) showed elevated fecal coliform levels throughout Pt. Judith Pond. This led to an emergency closure of the growing area on 7/27/2019. Following this, several precautionary closures of the growing area were instated during 2019 due to anticipated elevated fecal coliform levels after heavy rainfall.

Extensive wet-weather sampling during 2019 characterized the degree of fecal coliform pollution in the area after heavy rainfall. This led to the need to change the management of GA10 to account for elevated fecal coliform after heavy rain in the form of an emergency closure of 7-days in response to rainfall of greater than 2.5" in 24 hours. In addition, the northern region of Pt. Judith Pond was shown to exceed NSSP criteria after greater than 1.4" of rain fell at Westerly (KWST) in a 24-hour period. This northern region of Pt. Judith Pond was reclassified from Approved to Conditionally Approved (with 1.4" rain, 7-day closure) on February 1, 2020. The 2019 statistical summaries (below) are calculated for three scenarios: 1) managed with no rain closures (pre 2020 management strategy), 2) managed with a 2.5" emergency rain closure (2020-on management strategy), 3) managed with a 1.4" conditional area rain closure for the stations in the upper portion of Pt. Judith Pond. These statistical summaries demonstrated the effectiveness of the required management changes in maintaining compliance with NSSP criteria at all Approved and Conditionally Approved stations in the growing area.

No rain closure scenario:

Pt. Judith Pond and Potter Ponds were sampled eight times (7 wet weather, 1 dry weather) while in the open status during 2019. The wet weather of 2019 resulted in four of the sets of 2019 samples being collected two days or less after rainfall of 2.5” or greater. In addition, three of six sets of samples collected during 2018 were also during wet weather. There were 17 wet weather and 13 dry weather samples in the recent 30 sample data set used for calculation of compliance statistics. The 2019 statistical evaluation showed that four of six approved stations exceeded NSSP criteria in Pt. Judith Pond and that two of six approved stations in Potter Pond exceeded NSSP criteria if open during all weather conditions (see ‘no rain closure’ statistical table). Most of the elevated fecal coliform exceedances were observed after large rainfall (i.e., 2 days after 3.32” rain on 7/25/2019, 1.5 days after 3.92” rain on 10/18/2019). This analysis demonstrated that an emergency rain closure is needed to delay shellfish harvest during periods of unacceptable fecal coliform water quality following large (>2.5”) rainstorms..

2.5” rain emergency closure scenario

Application of the 2.5” emergency rain closure (added to GA10 management plan in February 2020) to the data set resulted in all approved stations in both Pt. Judith and Potter Ponds complying with NSSP fecal coliform criteria (see 2.5” emergency rain closure statistical table). This demonstrated that the 2.5” rain emergency closure is an effective management strategy for the approved stations in Pt. Judith and Potter Ponds.

1.4” rain conditional area

Three stations in upper Pt. Judith Pond (10-9, 10-10, 10-15) did not meet criteria under the 2.5” rain emergency closure management strategy. An analysis (described in the ‘GA10 Pt. Judith and Potter Pond Management Plan’) indicated that fecal coliform water quality near those stations reaches unacceptable levels after greater than 1.4” of rain falls in a 24-hour period. Accordingly, this area was reclassified as Conditionally Approved with a 1.4” rain, 7-day closure. After application of the 1.4” rain closure, conditionally approved stations 10-9, 10-10 and 10-15 in upper Pt. Judith met NSSP criteria while in the open status (see 2019 results for conditionally approved stations, below).

The 2019 statistical analysis demonstrated that the 2.5” emergency rain closure and 1.4” conditional area rain closure are effective management strategies to maintain acceptable water quality while GA10 is in the open status. All approved and conditionally approved stations in the growing area are in compliance with NSSP criteria under this management strategy.

- * Maintain 2.5” rain emergency closure for entire growing area.
- * Maintain 1.4” rain conditional closure in upper Pt. Judith Pond.
- * When practical, continue wet-weather sampling to further refine extent of closure areas and closure rainfall amounts.
- * Continue work to identify wet-weather fecal coliform sources to Pt. Judith and Potter Ponds.

RIDEM SHELLFISH GROWING AREA MONITORING: GA10

Recent 30 all weather (no rain closures)

(7/17/2015 to 12/16/2019; all mTEC, 17 wet and 13 dry weather)

These statistics shown for comparative purposes – not for compliance

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA10-1	P	30	61.3	1,018.2
GA10-2	P	30	42.4	804.0
GA10-3	P	30	27.9	449.9
GA10-5	P	30	13.6	173.5
GA10-7	P	30	10.9	131.8
GA10-9	CA	30	8.2	70.2
GA10-10	CA	30	9.0	86.2
GA10-11	A	30	6.8	55.6
GA10-12	A	30	5.7	42.1
GA10-15	CA	30	9.6	127.8
GA10-16	A	30	7.0	88.3
GA10-16A	A	30	6.5	42.7
GA10-17	A	30	4.6	22.3
GA10-19	P	30	8.4	63.2
GA10-20	P	30	5.6	24.1
GA10-21	P	30	5.4	23.4
GA10-22	A	30	3.4	11.0
GA10-23	P	30	5.6	25.7
GA10-24	A	30	6.9	42.4
GA10-27	A	30	5.4	27.9
GA10-28	A	30	4.0	17.9
GA10-29	A	30	3.4	12.2
GA10-30	A	30	5.2	33.3
GA10-31	A	30	4.7	24.3

RIDEM SHELLFISH GROWING AREA MONITORING: GA10

*Recent 30 all weather, with 2.5" emergency rain closure
(7/18/2014 to 12/16/2019; all mTEC, 13 wet and 17 dry weather)*

These statistics used for compliance at Approved stations

FECAL-GEO

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA10-1	P	30	38.9	552.8
GA10-2	P	30	23.8	355.5
GA10-3	P	30	16.1	166.7
GA10-5	P	30	8.6	58.9
GA10-7	P	30	6.2	41.3
GA10-9	CA	30	5.7	35.3
GA10-10	CA	30	5.1	30.5
GA10-11	A	30	4.1	15.4
GA10-12	A	30	3.6	10.7
GA10-15	CA	30	5.7	49.4
GA10-16	A	30	4.2	23.8
GA10-16A	A	30	4.6	19.1
GA10-17	A	30	3.1	8.6
GA10-19	P	30	5.3	23.3
GA10-20	P	30	3.8	11.5
GA10-21	P	30	4.4	16.8
GA10-22	A	30	2.8	7.0
GA10-23	P	30	4.1	14.8
GA10-24	A	30	5.4	25.0
GA10-27	A	30	4.4	18.2
GA10-28	A	30	3.3	11.0
GA10-29	A	30	2.8	7.8
GA10-30	A	30	3.7	14.7
GA10-31	A	30	3.7	14.5

RIDEM SHELLFISH GROWING AREA MONITORING: GA10

Recent 30 all weather (1.4" Conditional Approved area rain closure)

(7/17/2015 to 12/16/2019; all mTEC, 17 wet and 13 dry weather)

Statistics used for compliance at Conditionally Approved stations only

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA10-9	CA	30	4.9	24.6
GA10-10	CA	30	3.9	18.6
GA10-15	CA	30	3.3	11.9

7. Summary and Conclusions

The upper Pt. Judith Pond conditional area (closes for 7 days after 1.4" or greater rain at Westerly Airport) was created in February 2020 due to concerns about elevated fecal coliform in this area during wet weather. In addition, a 2.5" emergency closure of the entire growing area was instituted in February 2020 to safeguard shellfish harvest during elevated fecal coliform conditions following large, intense rainstorms of 2.5" or greater in 24-hours. The 2019 annual update of Pt. Judith and Potter Ponds (GA10) demonstrated that no shoreline sources are negatively impacting the microbiological water quality of the growing area when this area is in the open status for shellfish harvest.

The establishment of the upper Pt. Judith Pond Conditional Approved necessitated the drafting of the Pt. Judith Pond Growing Area 10 Conditional Area Management Plan (CAMP) in 2019. This CAMP was developed to ensure compliance and accurate representation of current procedures related to the operation and management of the conditionally approved areas within GA10. Implementation of the management strategies within the GA10 CAMP for these two areas began in February of 2020 concurrent with the announcement of the change to the shellfish notice reflecting the reclassification of these waters.

No further classification changes are recommended for GA10 at this time.

Growing Area 11 NG
Ninigret and Green Hill Ponds
2019 Annual Update

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1. Introduction

During 2019 an annual update shoreline survey was completed for the Ninigret Pond and Green Hill Pond shellfish growing area (GA11NG; Figure 1). Previous shoreline surveys of this area included comprehensive 12-year surveys completed in 2002 and 2012 and triennial surveys completed during 2005, 2008, 2011, 2015 and 2018. The 2019 annual re-evaluation shoreline survey was conducted in order to comply with National Shellfish Sanitation Program (NSSP) requirements for shellfish growing area classification. The primary objective of this shoreline survey was to identify and characterize sources of pollution affecting the area and re-evaluate point and non-point sources previously identified during prior surveys.

The Ninigret Pond and Green Hill Pond - Growing Area 11NG (Figure 1) presently has two classifications: Prohibited and Approved. The entirety of Green Hill Pond and the easterly section of Ninigret Pond adjoining Green Hill Pond are presently classified as prohibited to shellfishing due to elevated bacteria levels. The remainder of the growing area is in Ninigret Pond and is classified as Approved. There are twenty-three monitoring stations that are routinely sampled to characterize the water quality of the growing area.

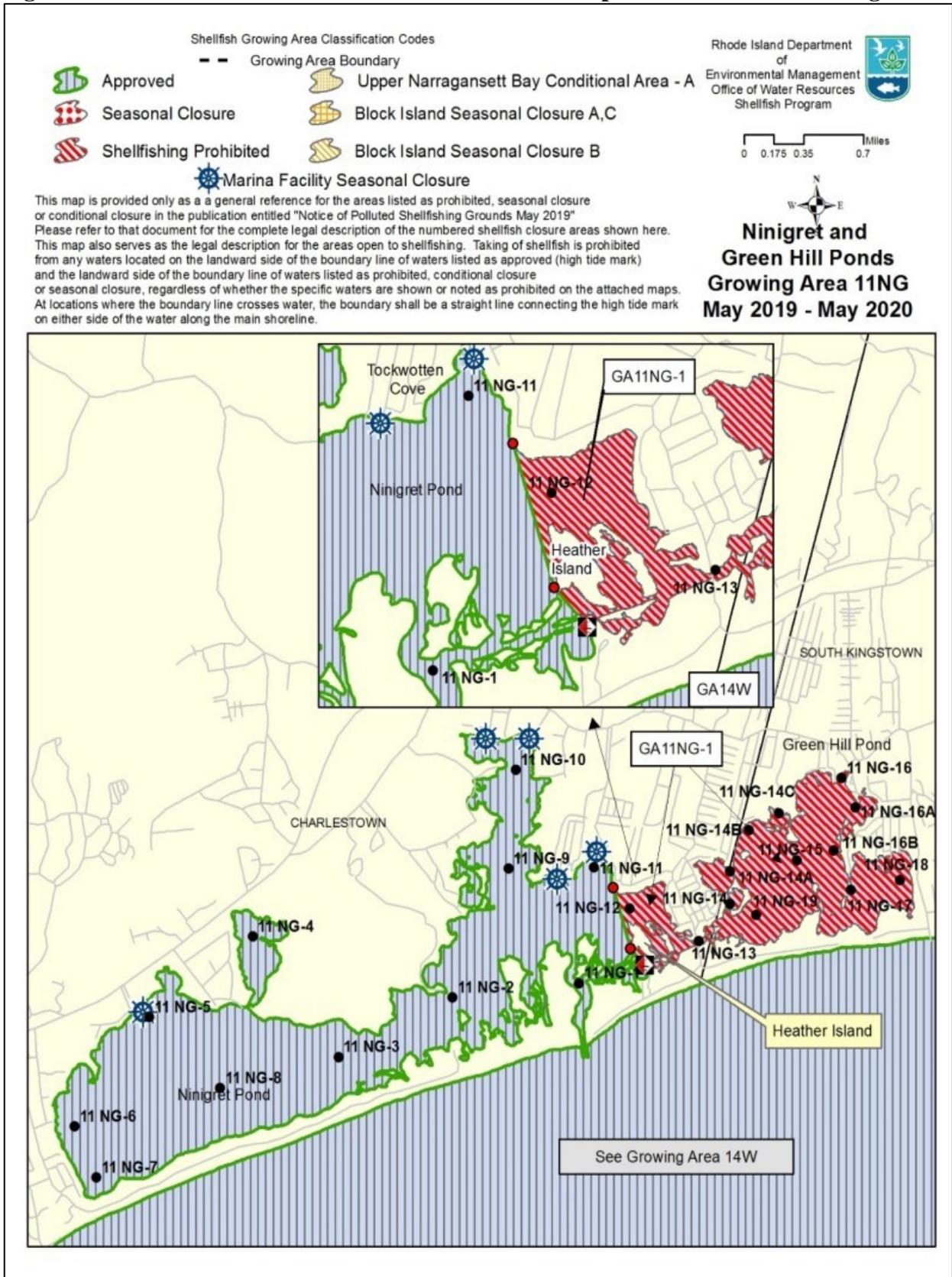
During the 2012 12-year survey a total of ten (10) actual or potential sources were identified, with five (5) sources discharging into each pond. In Green Hill Pond, all five (5) identified sources discharge or potentially discharge into waters that are currently classified as Prohibited. Only two (2) of the sources had greater than 240 cfu/100 ml results in the 2012 survey: source 11GH-01 (Factory Brook) and source 11GH-04 (a RCP outfall flowing into Allen Cove). Both of these sources discharge into the prohibited area of Green Hill Pond. There is sufficient dilution within the Green Hill Pond and eastern Ninigret Pond prohibited zone so that these sources have no impact on the microbiological water quality of the approved waters of Ninigret Pond.

In Ninigret Pond, five (5) sources were identified during the 2012 survey. One (1) source discharges to prohibited waters and four (4) sources discharge or potentially discharge into approved water of Ninigret Pond. Fecal coliform results from these four (4) sources were less than 240 cfu/100 ml or had low (trickle) flow during the 2018 survey (Table 1). Due to the 2018 survey results no sources were sampled in 2019.

2. 2019 Shoreline Survey

In 2019 no shoreline survey sources were sampled because bacteria counts were low in previous years. The 2019 annual update included a review of marinas and mooring areas in the growing area, a review of OWTS complaints and a review of growing area fecal coliform monitoring data.

Figure 1: 2019-2020 GA 11NG Shellfish Classification Map with Routine Monitoring Stations



3. Marinas and Mooring Areas

There are eleven recreational boating facilities, marinas or dockage areas located in Ninigret and Green Hill Ponds. Two are located in the prohibited Green Hill Pond and four others are located within the prohibited areas of Ninigret Pond. The remaining five located in approved waters are listed in the following table.

Table 1: Ninigret Pond Marinas.

Marina Facility Name (As Currently Known)	Number of Boats	Town	Latitude	Longitude
Lavins	70	Charlestown	41° 21.51'	-71° 41.31'
Ocean House Marina	95	Charlestown	41° 22.85'	-71° 38.70'
Fort Neck Association	25 (est.)	Charlestown	41° 22.85'	-71° 38.99'
Tockwotten Cove Assn	25 (est.)	Charlestown	41° 22.30'	-71° 38.24'
Pond Shore	15 (est.)	Charlestown	41° 22.17'	-71° 38.51'

There is a seasonal marina closure area described as that area within 25 feet of any in water structure for docking vessels around each of the five marinas listed (Table 21). Ocean House Marine, the largest marina in the growing area, operates a dock side marine pump out facility that is available to all boats operating in these waters. In addition, all waters in Rhode Island are designated as No Discharge Zones which prohibits the discharge of any sewage from any vessel within any waters of the state. Information regarding the enforcement and inspection procedures for vessels operating in RI waters can be found on the RI DEM website:

<http://www.dem.ri.gov/programs/water/shellfish/marine-pumpouts.php>

Dilution calculations supporting the sizing of prohibited safety zones surrounding marinas may be found in the document entitled 'RIDEM Marina Dilution Analysis – June 2017' and in the electronic Excel file '2017 Marina Calcs VIMS FDA' located in the program's permanent files.

4. Wastewater Treatment Facilities / Domestic wastes

There are no wastewater treatment facilities (WWTF), or any permitted RI Pollution Discharge Elimination (RIPDES) discharges that discharge to Growing Area 11NG.

The watershed to Ninigret and Greenhill Ponds consists of mainly residential homes with very little commercial and no industrial land developments. In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands.

Prohibited areas were established based on land use within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae

monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas were visually inspected for indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation was conducted during watershed background research. Follow-up sampling or further field work and evaluation was conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Ninigret or Green Hill Ponds due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

5. Water Quality Studies

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at twenty-four (24) monitoring stations throughout the growing area. Twelve (12) stations are in Ninigret Pond (11 Approved stations, 1 Prohibited station). Twelve (12) stations are located in Green Hill Pond; all are in Prohibited waters. are in Approved waters.

Samples are collected 1-2 feet below the water surface using 125 ml (4-ounce) sterile Nalgene bottles after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics were analyzed by the mTEC method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 11NG

HIGHLIGHTS

- * Sampled 6X during 2019.
- * Statistics represent recent 30 samples collected under both wet (n= 12) and dry (n= 18) weather conditions during *12/16/2014 or 5/5/015 to 11/6/2019*.
- * Elevated fecal coliform after rain of greater than 2.5".
- * All approved stations in compliance.
- * All samples analyzed by the mTEC method.
- * Data run 11/18/2019.

COMMENTARY

Ninigret Pond and Green Hill Ponds (Growing Area 11NG) were sampled six times (5X dry weather and 1X wet weather) during 2019, consistent with the minimum systematic random sampling monitoring requirements for approved areas. The recent 30 sample results are representative of both wet (n= 12) and dry (n= 18) weather conditions.

The 2019 statistical review demonstrated that all approved stations in Ninigret Pond met criteria for shellfish harvest for direct human consumption. However, two stations, 11NG-10 located at the northern end of Ninigret Pond east of Marshneck Point and 11NG-4 (located in Foster Cove) have had recent increases in fecal coliform variability such that the variability statistics is approaching the NSSP criteria (31 cfu/100 ml). Rainfall in the area was above normal during both 2018 and 2019, with 53.0” of rain received at Westerly Airport (weather station KWST) during 2018 and 59.1” received during 2019 compared to a long-term average annual rainfall of 43.2”. Elevated fecal coliform observations in the growing area mainly occurred following intense rainfall such as 6/26/2019 (1 day after 1.80” rain) and 7/25/2019 (1 day after 3.32” rain). In order to ensure shellfish harvest occurs only when the waters of the growing area meet microbiological standards, an emergency rain closure for rainfall of greater than 2.5” in a 24-hour period as measured at Westerly Airport is recommended. Application of this 2.5” rain emergency closure results in all approved stations meeting NSSP criteria for direct marketing of molluscan shellfish. The 2.5” emergency rain closure was instituted for GA11NG in February 2020.

Note that even with a 2.5” rain closure, station 11NG-4 (Foster Cove) and station 11NG-10 (Marshneck Pt.) had variability statistics of 25 to 30 cfu/100 ml which is approaching the NSSP variability criteria of 31 cfu/100 ml. Also, the ‘sentinel station’ 11NG-12 that marks the transition from approved waters in the western end of Ninigret Pond to prohibited waters at the far eastern end of Ninigret Pond and Green Hill Pond exceeded NSSP variability criteria in the 2019 evaluation. This is likely reflective of the wet weather experienced during 2018 and 2019. Continued monitoring of this station is required to determine if westward expansion of reduced water quality from eastern Ninigret and Green Hill Pond continues.

Shellfishing is prohibited in Green Hill Pond due to elevated and unpredictable fecal coliform concentration. A TMDL study of Green Hill Pond was completed in 2006. The TMDL study identified freshwater streams in the north-northeast side of Green Hill Pond and groundwater as sources of fecal coliform. 2019 ambient monitoring results are consistent with this, indicating elevated fecal coliform levels exceeding NSSP standards for shellfish harvest at stations along the northern side of Green Hill Pond. Stations on the south side of Green Hill Pond displayed lower but highly variable (90th percentile statistic above NSSP threshold) and unpredictable fecal coliform levels. The 2019 statistical evaluation demonstrated that none of the twelve (12) stations located in Green Hill Pond met NSSP criteria for harvest of shellfish. Future monitoring will continue in Green Hill Pond to track and support TMDL and other water quality improvement efforts in the watershed.

All approved stations in the growing area are in program compliance and the GA11NG growing area (Ninigret and Green Hill Pond) is properly classified.

RECOMMENDATIONS

- * 2.5" rain emergency closure required to maintain compliance with NSSP criteria.
- * Carefully review future results for stations 11NG-1 (Foster Cove), 11NG-10 (Marshneck Point) and sentinel station 11NG-12. These stations had increased fecal coliform variability in 2019.
- * Continue sampling in shellfishing-prohibited Green Hill Pond to support TMDL study and to track changes in fecal coliform concentration.

RIDEM SHELLFISH GROWING AREA MONITORING: GA11NG

***Recent 30, all weather Recent 30 all weather (with 2.5" emergency rain closure).
(10/17/2014 to 11/6/2019; all mTEC, 11 wet and 19 dry weather)***

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA11NG-1	A	30	4.3	20.6
GA11NG-2	A	30	3.0	8.4
GA11NG-3	A	30	2.8	8.0
GA11NG-4	A	30	5.8	29.1
GA11NG-5	A	30	2.6	5.5
GA11NG-6	A	30	2.5	5.3
GA11NG-7	A	30	2.9	8.7
GA11NG-8	A	30	2.6	5.3
GA11NG-9	A	30	4.1	19.4
GA11NG-10	A	30	4.5	25.9
GA11NG-11	A	30	3.2	9.5
GA11NG-12	P	30	7.2	56.4
GA11NG-13	P	30	7.0	57.2
GA11NG-14	P	30	10.6	98.8
GA11NG-14A	P	30	11.6	82.5
GA11NG-14B	P	30	6.2	35.5
GA11NG-14C	P	30	27.0	237.5
GA11NG-15	P	30	5.2	35.0
GA11NG-16	P	30	27.5	323.3
GA11NG-16A	P	30	11.6	104.0
GA11NG-16B	P	30	8.5	70.2
GA11NG-17	P	30	7.2	61.7
GA11NG-18	P	30	5.6	35.4
GA11NG-19**	P	7	9.6	159.1

** new station added in 2017; number of observations is low (n= 7) and insufficient data to calculate representative statistics for compliance.

6. Summary and Conclusions

The 2019 GA11NG annual review documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area under normal weather conditions. The 2019 statistical review of growing area monitoring data identified fecal coliform exceedances of NSSP standards during extremely wet weather (>2.5" rain in a 24-hour period). To safeguard public health and emergency 7-day closure of following 2.5" of rain or greater at Westerly Airport in a 24-hour period was added to the management of the growing area in February 2020. The 2019 annual update demonstrated that all monitoring stations in the growing area meet NSSP criteria while in the open status.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

Growing Area 11QW
Quonochontaug and Winnapaug Ponds
2019 Annual Update

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Growing Area 11QW
Quonochontaug and Winnapaug Ponds
2019 Annual Update

1. Introduction

A triennial re-evaluation shoreline survey of the Quonochontaug Pond and Winnapaug Pond shellfish growing area GA11QW was conducted during 2019 in order to comply with National Shellfish Sanitation Program (NSSP) requirements for shellfish growing area classification. The primary objective of this shoreline survey was to identify and characterize sources of pollution affecting the area and re-evaluate point and non-point sources previously identified during prior surveys.

A comprehensive 12-year shoreline survey of Quonochontaug and Winnapaug Ponds (Growing Area 11QW; Figure 1) was last conducted in 2012, and triennial updates were completed in 2015 and 2018. The last 12-year shoreline survey identified a total of twenty-six (26) actual or potential sources, seventeen (17) in Quonochontaug Pond and nine (9) in Winnapaug Pond. In the 2018 triennial update a total of eight (8) sources were identified, with three (3) having no flows at the time of the survey. Five (5) actual or potential fecal coliform sources were sampled during the 2018 shoreline survey of GA11QW. All fecal coliform concentration in flowing sources were less than the 2,400 cfu/100 ml threshold, therefore no sources were required to be sampled for the 2019 annual update.

2. 2019 Survey

No follow-up source sampling was required for the 2019 annual update of GA11QW because all sources were less than 2,400 cfu/100 ml or were low (trickle) flow in the 2018 triennial survey (Table 1). Five (5) actual or potential fecal coliform sources were sampled during the 2018 shoreline survey of GA11QW and fecal coliform concentration in flowing sources ranged from 11 to 500 cfu/100 ml (Table 1). A review of OWTS complaints in the growing area and a review of 2019 fecal monitoring data was completed as part of the 2019 update of GA11QW.

In addition to identifying fecal coliform sources, all actual and potential pollution sources

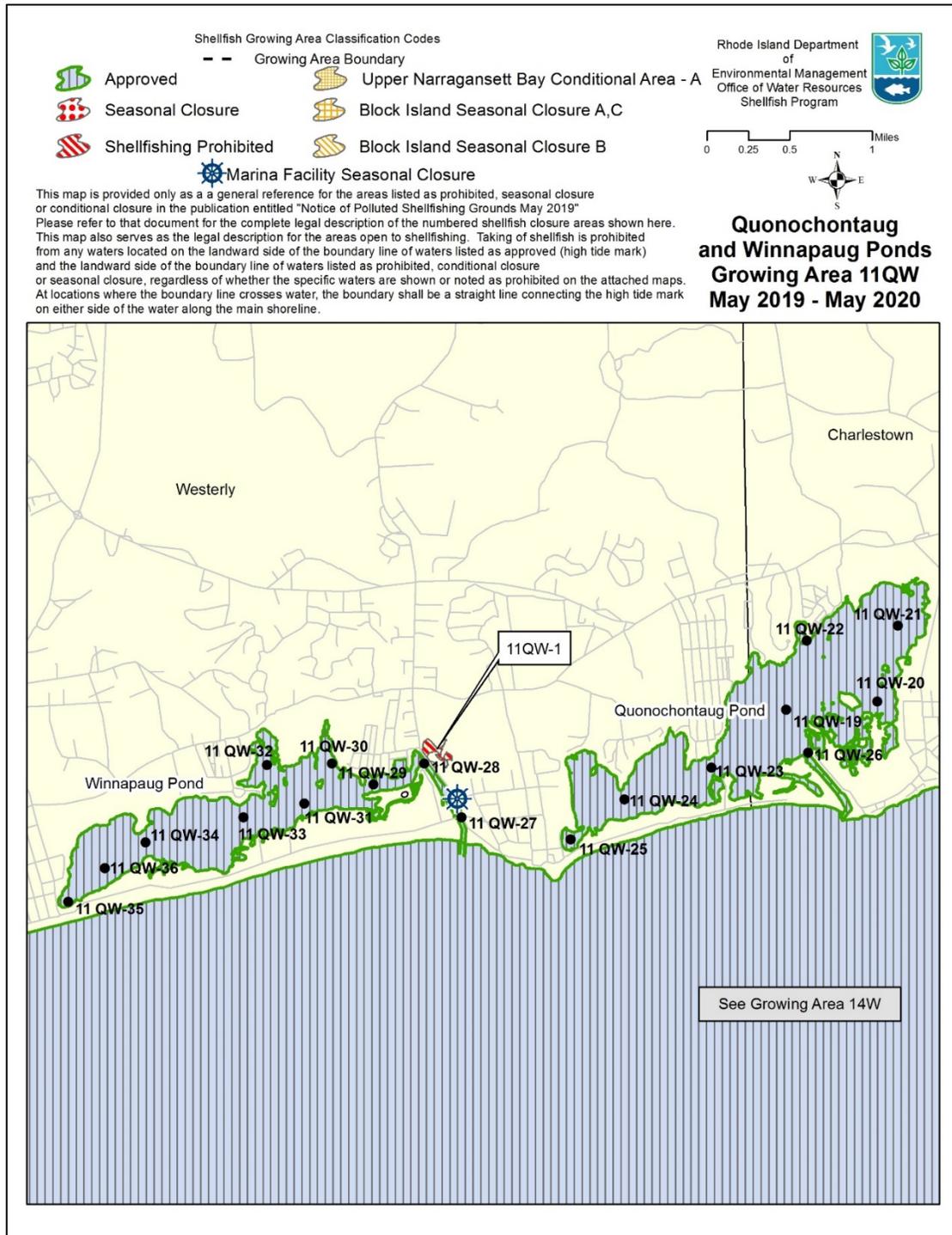
discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Quonochontaug or Winnapaug Ponds due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

Table 1: GA11QW Shoreline survey pollution sources and 2018 results

Source ID	Latitude	Longitude	Description and Location	Receiving Waters Classification	Act/ Pot	Dir/ Indir	2012 Results	2018 Results	Volumetric Flow (cfs)
11QW-4	41.3484	-71.72383	Stream	Approved	A	D	660	160	0.02
11QW-5	41.3475	-71.72417	Stream in cove west side	Approved	A	D	0	500	0.08
11QW-6	41.34545	-71.72892	Stream at end of ROW at end of Warren Rd	Approved	A	D	460	480	0.33
11QW-9	41.3368	-71.7513	Stream at culvert crossing Havesham road draining pond	Approved	A	D	132	120	0.17
11QW-11A	41.33712	-71.767336	Culvert at upstream Weekapaug Rd draining pond	Approved	A	D	60	11	5

Figure 1: 2019-2020 GA11QW Shellfish Classification Map with Routine Monitoring Stations



3. Marina and Mooring Areas

There are two marinas identified in the growing area, one in each pond. The Weekapaug Yacht club, located in a small cove on the southwestern corner of Quonochontaug Pond is a small day-sailing school that operates only during the summer months. It has no permanent docks and all boats are either moored or stored on the beach. The facility has a land-based sanitary service and the boats used here do not have MSDs. The Weekapaug Fire District has a series of docks located along the Weekapaug Breachway in Winnapaug Pond. There is a seasonal (summer only) closure associated with these docks. Marina closures are sized so that there is sufficient dilution to be protective during the seasonal operation of marina facilities. The dilution analysis supporting marina closures is in the document entitled “RIDEM Marina Dilution Analysis – June 2017” which is maintained in the program’s permanent files.

4. Wastewater Treatment Facilities

There are no wastewater treatment facilities (WWTF), or any permitted RI Pollution Discharge Elimination (RIPDES) discharges that discharge to either pond in GA11QW.

The entire watersheds of Quonochontaug and Winnapaug Ponds are served by On-Site Wastewater Treatment systems (OWTS). There is a mix of types of systems ranging from cesspools, conventional and innovative and advanced systems located in the towns of Charlestown and Westerly (bordering communities). Since 2011 legislation has required that all cesspools located within the critical resource area boundary and within 200ft of the inland edge of coastal shoreline feature bordering a tidal water area must be replaced and upgraded with a new onsite wastewater treatment system or connected to available municipal sewer lines by January 2014.

Table 2. 2019 OWTS complaints in GA11QW

Address	Town	Date	Complaint	Location in relation to GA	OC&I Action
27 BREACH DR	WESTERLY	5/20/2019	Cesspool phaseout, Failed to comply with hardship extension	On Weekapaug Breachway	Inspected, no violation found
30 HARBOR DR	WESTERLY	6/26/2019	Property has a cesspool and is subject to the cesspool phaseout act.	On Winnipaug Pond	Inspected, Citation and Notice of Violation issued, cesspool not replaced
Breachway	WESTERLY	8/7/2019	Sewage odors; not quite sure where they are coming from.	Breachway	Inspected, no violation found

5. Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of

Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at eighteen (18) monitoring stations throughout the growing area (Figure 1). Eight (8) stations are located in Quonochontaug Pond and ten (10) stations are located in Winnapaug Pond. All water quality monitoring stations in GA11QW are located in Approved waters.

Samples are collected 1-2 feet below the water surface using 125 ml (4-ounce) sterile Nalgene bottles after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics were analyzed by the mTec method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 11QW:

HIGHLIGHTS

- * Sampled 7X during 2019; 6X when open (5 wet, 1 dry), 1X when in the closed status.
- * Emergency closure of Winnapaug pond 7/26/2019 to 7/31/2019 due to elevated fecal coliform after heavy rain.
- * Compliance statistics calculated for recent 30 samples when area was in the open status (5/14/2015 to 10/16/2019, 16 wet weather and 14 dry weather samples).
- * Compliance statistics also calculated with 2.5” rain emergency closure scenario (10/28/2014 to 10/16/2019, 15 wet weather and 15 dry weather samples).
- * Station 11QW-25 (Weekapaug Yacht Club) exceeded NSSP criteria for all weather data.
- * All approved stations meet criteria with 2.5” rain emergency closure.
- * All samples analyzed by the mTEC method.
- * Data run 11/18/2019.

COMMENTARY

Winnapaug and Quonochontaug Ponds (Growing Area 11QW) were sampled seven times during 2019 (6X when open). Winnapaug Pond had an emergency closure during 7/26/2019 to 7/31/2019 after random sampling detected elevated fecal coliforms on 7/24/2019. This randomly selected sample date (7/24/2019) was one day after 3.32" of rain fell at Westerly Airport in a 24-hour period. Wet weather during 2018 and 2019 resulted in the recent 30 samples used to calculate compliance statistics having 16 wet weather sets of samples and 14 dry weather samples. Compliance statistics calculated from samples collected during all weather conditions when the area was open indicated that one approved station (station 11QW-25) violated NSSP criteria for shellfish harvest. Station 11QW-25, located in the basin near Weekapaug Yacht Club in Quonochontaug Pond, had a variability criteria of 39.2 cfu/100 ml which exceeded the NSSP standard of 31 cfu/100 ml. Stations 11QW-22 (Shady Harbor in Quonochontaug Pond) and station 11QW-35 (far southwest corner of Winnapaug Pond) also had elevated, but acceptable, fecal coliform variability during 2019. Elevated fecal coliform results from samples collected 1-2 days after large rainstorms, such as 7/24/2019, 1 day after an intense downpour of 3.32" rain, were the main cause of increased and unacceptable fecal coliform variability identified in the 2019 review.

Because of the elevated fecal coliform associated with large rainstorms, a 2.5" rain (in a 24-hr. period as measured at Westerly Airport) emergency closure of 7-days duration was instated for all salt pond growing areas in February 2020. Recalculation of compliance statistics with the 2.5" rain emergency closure resulted in all approved stations in Quonochontaug and Winnapaug Ponds meeting NSSP criteria. The growing area is in program compliance with application of the 2.5" rain emergency closure and the area is properly classified.

RECOMMENDATIONS

* 2.5" rain emergency closure is required to maintain compliance with NSSP criteria.

RIDEM SHELLFISH GROWING AREA MONITORING: GA11QW

Recent 30 all weather.

(5/14/2015 to 10/16/2019; all mTEC, 16 wet and 14 dry weather)

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA11QW-19	A	30	2.7	7.0
GA11QW-20	A	30	2.8	7.0
GA11QW-21	A	30	2.6	5.7
GA11QW-22	A	30	5.0	25.3
GA11QW-23	A	30	3.0	9.5
GA11QW-24	A	30	3.0	9.9
GA11QW-25	A	30	5.4	39.2
GA11QW-26	A	30	2.5	5.6
GA11QW-27	A	30	2.8	6.7
GA11QW-28	A	30	3.0	7.2
GA11QW-29	A	30	3.1	9.3
GA11QW-30	A	30	4.3	15.9
GA11QW-31	A	30	2.8	9.6
GA11QW-32	A	30	3.8	13.3
GA11QW-33	A	30	3.1	10.1
GA11QW-34	A	30	3.2	15.6
GA11QW-35	A	30	3.9	23.9
GA11QW-36	A	30	3.2	16.5

6. Summary and Conclusions

The 2019 review documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area. The 2019 review of fecal coliform water quality data indicated that an emergency rain closure for rain amounts of greater than 2.5” is required for this growing area to maintain compliance with NSSP standards. This 2.5” emergency rain closure was instituted in February 2020. With application of the 2.5” emergency rain closure the 2019 annual update demonstrated that all monitoring stations in the growing area meet NSSP criteria while in the open status.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

**Growing Area 12:
Little Narragansett Bay and Pawcatuck River
2019 Annual Update**

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1. Introduction

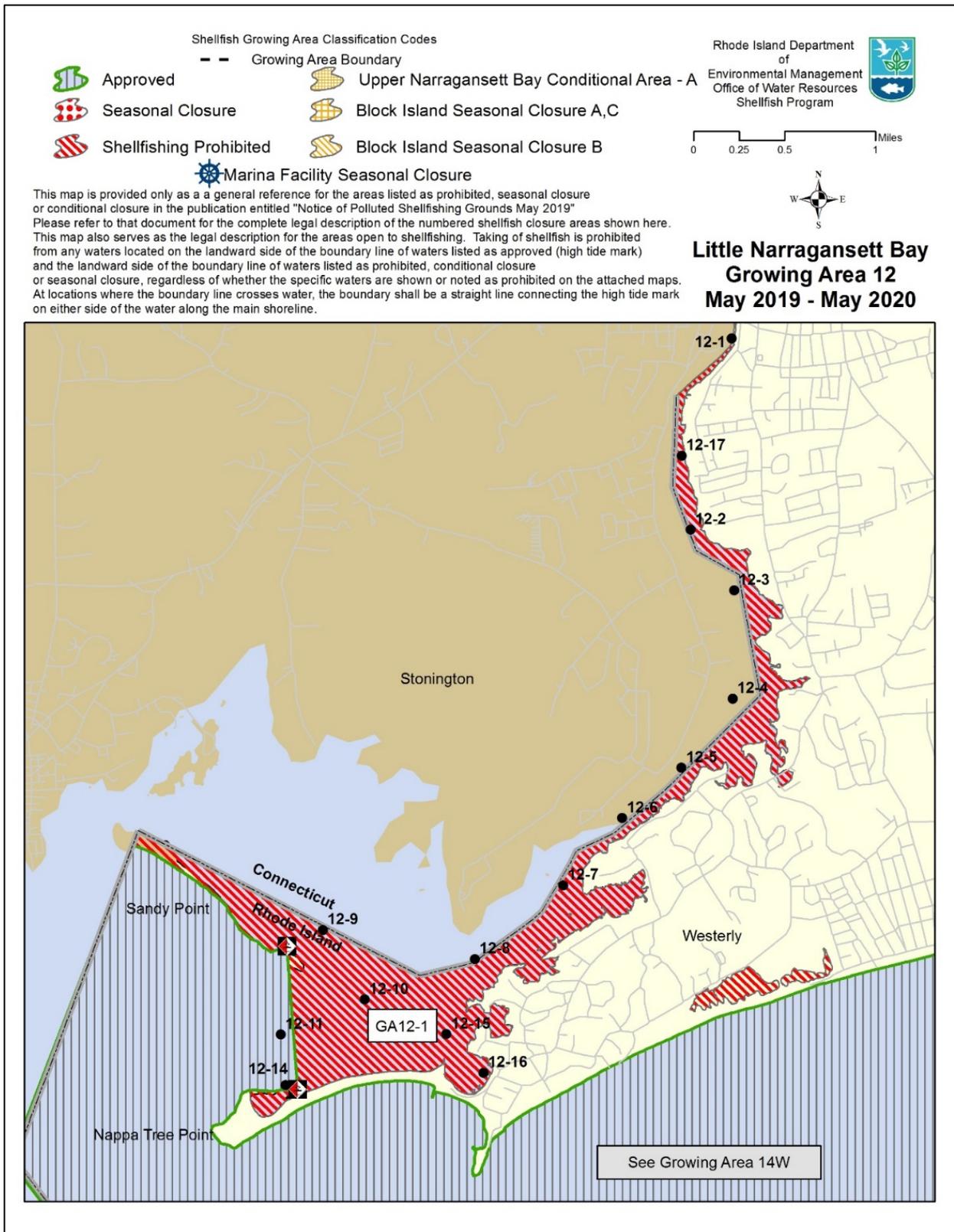
Little Narragansett Bay is an embayment located at the mouth of the Pawcatuck River, behind the barrier beach of Napatree Point. Little Narragansett Bay is located in the southwestern corner of Rhode Island adjacent to the Rhode Island – Connecticut state line. All waters of the Little Narragansett Bay (Growing Area 12, Figure 1) are currently prohibited to shellfishing due to elevated fecal coliform concentration. A fecal coliform loading TMDL study of Little Narragansett Bay was approved by EPA in December of 2010. The TMDL-recommended implementation activities that focused on stormwater control, wastewater treatment, and waterfowl management (RI DEM, 2010). As part of that ongoing effort sampling has been conducted in the past several years by RI DEM TMDL and Shellfish staff in partnership with Save the Bay. This has allowed for more frequent sampling as the Save the Bay boat is readily available in the Westerly area. The collaborative sampling effort with Save the Bay has resulted in more frequent sampling of this growing area (five or six times per year) for the past several years. This recent data is more representative of current conditions in Little Narragansett Bay and the Pawcatuck River versus historic sampling that had been sporadic due to limited resources.

In addition to closures due to unacceptable fecal coliform water quality, there are approximately a dozen commercial marinas and mooring fields within these prohibited waters. All waters of Little Narragansett Bay within and adjacent to these marinas are currently classified as prohibited. By calculation there is sufficient dilution within these prohibited waters to be protective of adjacent shellfish harvesting waters. These calculations and marina details can be found in the document entitled “Marina Dilution Analysis – June 2017” and within the electronic excel file 2017 Marina Calcs CIMS_FDA located in the program’s permanent files.

2. 2019 Survey

Because the entirety of the Rhode Island portions of Little Narragansett Bay is classified as Prohibited (Figure 1), there has not been a comprehensive shoreline survey of the area by the shellfish program staff. This 2019 update summarizes recent fecal coliform water quality data in the growing area in support of TMDL efforts and to track potential changes in fecal coliform water quality. A TMDL report of fecal coliform was completed in 2010, which included a brief shoreline survey.

Figure 1: 2019-2020 Shellfish Classification Map of GA 12 with Routine Monitoring Stations



3. Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at fifteen (15) monitoring stations throughout the growing area (Figure 1). Fourteen (14) monitoring stations are in Prohibited waters and one (1) station (station 12-11) is a 'sentinel station' in Approved waters just west of the Prohibited region of Little Narragansett Bay.

Samples are collected 1-2 feet below the water surface using 125 ml (4-ounce) sterile Nalgene bottles after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics were analyzed by the mTEC method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 12:

HIGHLIGHTS

- * Sampled 6X during 2019.
- * The area is classified as prohibited, with the exception of sentinel station 12-11 which is located on the line between approved and prohibited waters.
- * For approved station 12-11, statistics represent recent 30 samples collected under both wet (n= 15) and dry (n= 15) weather conditions during 9/30/2014 to 10/24/2019.
- * Statistics for prohibited stations calculated for information purposes only, not for compliance.
- * Informational statistics calculated for conditionally approved management scenario of 7-day closure after greater than 0.5” rain in 24 hours.
- * Approved station 12-11 is in compliance.
- * All samples analyzed by the mTEC method.
- * Data run 12/17/2019.

COMMENTARY

Little Narragansett Bay (Growing Area 12) was sampled six times during 2019 through a cooperative partnership between DEM Office of Water Resources and Save the Bay. 2019 samples included four collected during wet weather and two collected during dry weather. The area is classified as prohibited, so there is no minimum sampling requirement. The sentinel station (12-11) on the line between approved and prohibited waters is in compliance for 2019, demonstrating that the current closure line is appropriate. For more than ~20 years the area has been closed to shellfish harvest for direct human consumption due to elevated and unpredictable fecal coliform levels during wet weather. A TMDL study of the area was completed in 2010, with a focus on improving stormwater and wastewater management and reducing waterfowl impacts in the Pawcatuck River watershed.

The 2019 statistical review indicated that Little Narragansett Bay does not meet NSSP water quality criteria for shellfish harvest. The wet weather experienced in the area during 2019 (4 of 6 2019-samples were collected during wet weather) contributed to a decline in 2019 fecal coliform water quality statistics compared to those calculated at the end of 2018. Under a scenario of conditionally approved management with a 0.5”, 7-day rain closure six stations (12-8, 12-9, 12-10,

12-11, 12-14 and 12-15) in the central portion of Little Narragansett Bay would meet NSSP criteria during dry weather. The elevated and unpredictable fecal coliform response to rainfall indicates that the area is currently properly classified as prohibited for shellfish harvest.

RECOMMENDATIONS

- * Continue cooperative sampling effort with Save the Bay to monitor changing water quality and to support TMDL work in the watershed.
- * No other actions recommended.

RIDEM SHELLFISH GROWING AREA MONITORING: GA12

The prohibited-status stations in GA12 (Little Narragansett Bay and Pawcatuck River) were evaluated under two potential management scenarios (below). The area is classified as Prohibited; statistics shown for informational purposes only, not for compliance.

Approved scenario: Recent 30 all weather.

(9/30/2014 to 10/24/2019; all mTEC, 15 wet and 15 dry weather)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA12-1	P	30	184.7	726.1
GA12-2	P	30	150.7	800.7
GA12-3	P	30	141.1	839.1
GA12-4	P	30	60.8	441.5
GA12-5	P	30	45.6	467.9
GA12-6	P	30	25.6	331.2
GA12-7	P	30	16.8	156.4
GA12-8	P	30	11.8	100.7
GA12-9	P	30	5.5	41.7
GA12-10	P	30	6.5	37.4
GA12-11	A	30	4.2	28.1
GA12-14	P	30	4.6	15.3
GA12-15	P	30	8.5	48.9
GA12-16	P	30	15.2	120.1
GA12-17	P	30	70.2	299.9

RIDEM SHELLFISH GROWING AREA MONITORING: GA12

***Conditionally approved scenario: Recent 15 dry (<0.5” in prior 7 days) weather only.
(9/30/2014 to 9/30/2019, all mTEC, all dry weather of <0.5” in prior 7 days)***

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA12-1	P	15	124.3	100
GA12-2	P	15	84.4	93.3
GA12-3	P	15	84.2	93.3
GA12-4	P	15	26.5	40.0
GA12-5	P	15	19.1	33.3
GA12-6	P	15	9.7	20.0
GA12-7	P	15	7.5	13.3
GA12-8	P	15	4.0	6.7
GA12-9	P	15	2.5	0.0
GA12-10	P	15	2.9	0.0
GA12-11	A	15	2.6	6.7
GA12-14	P	15	2.6	0.0
GA12-15	P	15	5.3	6.7
GA12-16	P	15	9.5	20.0
GA12-17	P	15	48.0	66.7

4. Summary and Conclusions

The 2019 review of fecal coliform water quality data indicated that fecal coliform water quality in GA12 does not meet NSSP standards under all weather conditions. Fecal coliform concentration in the growing area is elevated during wet weather. Analysis of recent data indicated that several stations in the central region of Little Narragansett Bay would meet criteria under a Conditionally Approved scenario, with the area closed for 7-days after 0.5” or greater rain. However, fecal coliform levels in the growing area are variable and continued monitoring under all weather conditions is required to demonstrate that water quality is reliably meeting NSSP criteria prior to possible reclassification.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

Literature Cited:

RI DEM, 2010. Total maximum daily load (TMDL) analysis for the Pawcatuck River and Little Narragansett Bay bacteria impairments. 83 pages. Available at:

<http://www.dem.ri.gov/programs/benviron/water/quality/rest/pdfs/lnbwdrft.pdf>

Growing Area 13
Great Salt Pond at Block Island
2019 Annual Update

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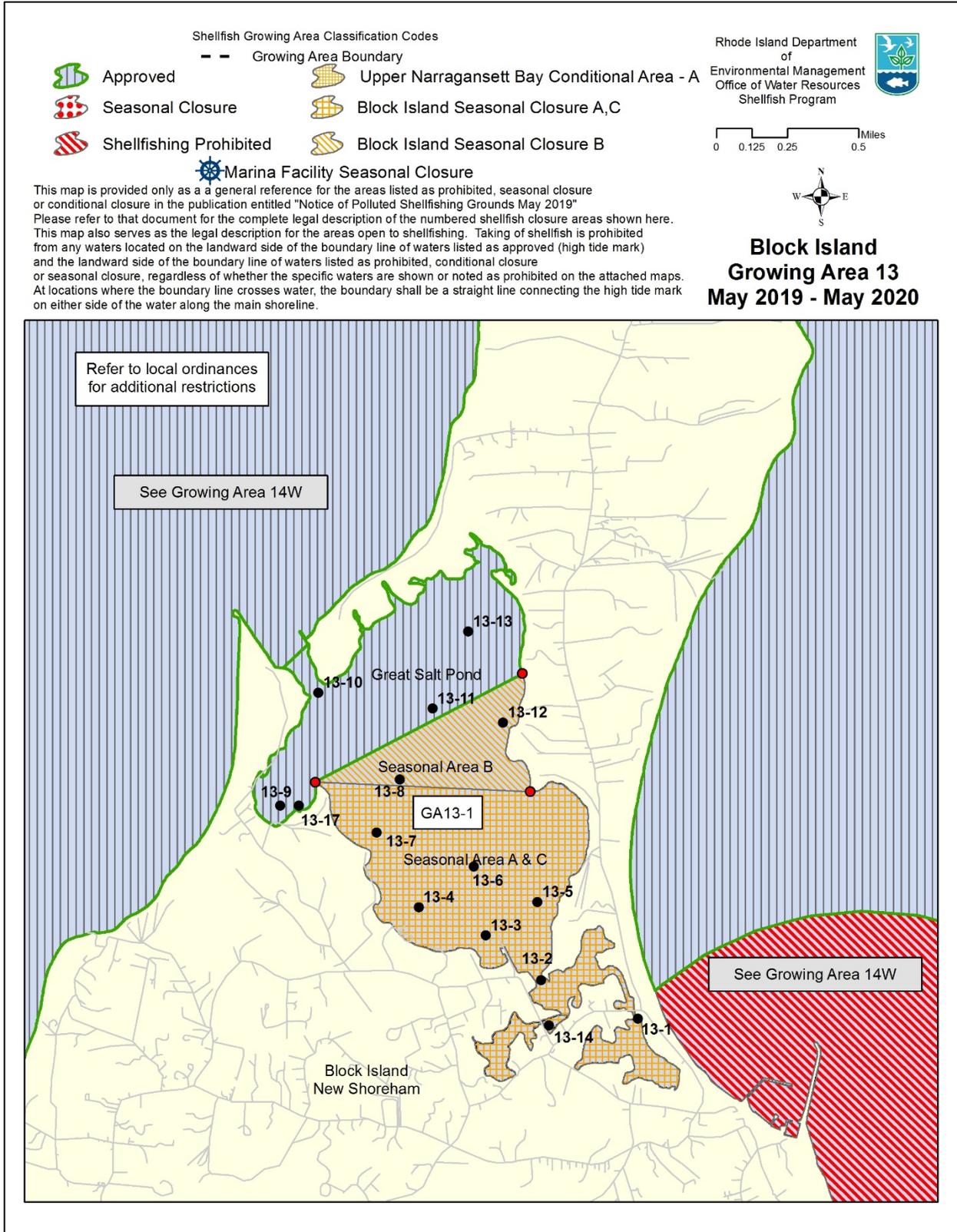
1. Introduction

A comprehensive 12-year sanitary survey of Great Salt Pond, Harbor Pond and Trims Pond on Block Island (Growing Area 13) was conducted in 2018. The 2018 survey involved a shoreline reconnaissance of the growing area to locate and catalog pollution sources and collect bacteriological samples from all sources actively flowing into the study area. All locations within the growing area were surveyed regardless of their classification. The primary objective of the sanitary survey was to identify and characterize any sources of pollution impacting the growing

area, to reevaluate point and nonpoint sources identified during previous surveys, and to update information regarding the sampling of previously identified sources.

Thirteen (13) sources were identified during the 12-year survey of GA13 (Table 1) completed in 2018. These sources included tributaries, pipes, and seeps. There were no large concentrations of waterfowl or wildlife observed during the field reconnaissance. Several small-scale “hobby farms” with resident livestock are scattered about the island, but these small operations do not seem to actually or potentially impact the receiving waters. No sources sampled during 2018 surpassed the 2,400 cfu/100 mL threshold for annual resampling. Therefore, no sources were re-sampled as part of the 2019 annual update.

Figure 1: 2019-2020 Shellfish Classification Map of GA13 with Routine Monitoring Stations



2. 2019 Survey

No sources sampled during the 2018 survey surpassed the 2,400 cfu/100 mL threshold for resampling (Table 1) as part of the 2019 annual update. The 2019 update of GA13 included a review of OWTS complaints adjacent to the growing area and a review of fecal coliform data collected at monitoring stations in the growing area.

Table 1: 2018 Growing Area 13 Shoreline Survey Sources

Source ID	Lat	Long	Description	2018 Survey Date	Act_Pot	Dir_Ind	2006 Results (MPN)	2009 Results (MPN)	2012 Results (CFU)	2016 Results (CFU)	2018 Results (CFU)	2018 Flow
13-001	41.17522	-71.5634	Tributary upper Harbor Pond	8/21/2018	A	D	430	1,100	525	1000	600	1 CFS
13-002	41.17195	-71.56702	Tributary upper Harbor Pond Noted 2 Deer	8/21/2018	P	D	230				No sample	No flow
13-003	41.17608	-71.57	Tributary into Harbor Pond near power station	8/22/2018	A	D	210				100	Trickle
13-004	41.1834	-71.56863	Tributary into Trims Pond	8/22/2018	A	D	930	15	167		100	Trickle
13-005	41.17708	-71.5732	Upper Trims pond tributary	8/21/2018	A	D	430	NF	NF		100	Trickle
13-006	41.17733	-71.57678	Upper Tributary	8/22/2018	A	D	93				910	Trickle
13-007	41.17562	-71.5748	Trims Pond Tributary	8/22/2018	A	D	1100	NF	8000	340	100	Trickle
13-008	41.19922	-71.57368	Great Salt Pond Andy's Way seep green growth	8/22/2018	A	D	2100	460	NF		100	Trickle
13-009	41.1936	-71.57425	Great Salt Pond marine railway wetlands pond drains	8/22/2018	A	D	2300	36	NF		100	0.3 CFS
13-010	41.18915	-71.58882	Cormerant Cove outfall drains wetland complex	8/22/2018	A	D	9300	9 sample)			300	0.61 CFS
13-011	41.18202	-71.57935	west of Harbor Master shack drains wetland	8/22/2018	A	D	1500	1,100	818	1600	600	1 CFS
2018-13-012	41.1985690	-71.584409	streaming draining upland marsh	8/20/2018	A	D					100	1.01 CFS
2018-13-013	41.1998610	-71.581805	stream draining upland marsh at old breach cut	8/20/2018	A	D					100	0.35 CFS

During the 2018 comprehensive survey all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. Possible sources of these substances are

industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of GA13 due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

3. Marinas and Mooring Areas

Great Salt Pond on Block Island is a destination harbor that sees a dramatic increase in number of visiting boats during the summer months. There are six (6) commercial marinas that have nearly 450 slips and moorings available to the boating public in Great Salt Pond. Two (2) staggered seasonal closures go into effect beginning in May and expanding in June, which encompasses almost three quarters of the pond. These seasonal closures last through the recreational boating season and end in October. Sampling of the growing area is completed once per month, year-round in a cooperative effort with the Block Island Harbor Master's office. A marina dilution calculation was performed and is detailed in the summary report entitled "Marina Dilution Analysis – June 2017" and also within the electronic excel document 2017 Marina Calcs VIMS FDA on file in the program's permanent files. By calculations there is sufficient dilution within these seasonal closures to be protective of adjacent shellfishing waters. The Town of New Shoreham operates five (5) pump out boats that operate in the Great Salt Pond in addition to a fixed station located in Old Harbor outside of this growing area that service the seasonal increase in docked and moored vessels in Block Island waters.

4. Wastewater Treatment Facilities

New Shoreham has a centralized 0.45 MGD wastewater treatment facility that serves approximately 50% of the population during winter and approximately 20% of the population during summer (New Shoreham Comprehensive Plan, 2016). The New Shoreham WWTP discharges treated effluent to Block Island Sound. The southern portion of the Great Pond watershed, namely the densely populated region from Champlin's Marine east to Old Harbor is serviced by sewer. The remainder of the watershed is served by on-site wastewater treatment systems (OWTS). Block Island has implemented increased inspection of the island's OWTS recently and 272 (of 1,674) OWTS systems have been identified as sub-standard and have been repaired or upgraded since 2015 (New Shoreham Comprehensive Plan, 2016).

5. Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at fifteen (15) monitoring stations located throughout Growing Area 13 (Figure 1). Four (4) stations have the Approved classification, ten (10) stations are in Seasonally Approved waters and one (1) station is located in Prohibited waters.

Samples are collected 1-2 feet below the water surface using 125 ml (4-ounce) sterile Nalgene bottles after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics were analyzed by the mTEC method. Fecal coliform results are sent to the

RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 13:

HIGHLIGHTS

- * Sampled 12X during 2019 season (11X during 2019, 1X in January 2020).
- * For approved stations, statistics represent recent 30 samples collected under both wet (n= 13) and dry (n= 17) weather conditions during 7/11/2017 to 1/14/2020.
- * For seasonally approved stations, statistics represent recent 15 samples when area was open 12/18/2017 or 1/24/2018 to 1/14/2020 during both wet (n= 6) and dry (n= 9) conditions.
- * All approved stations in compliance.
- * All seasonally approved stations in compliance.
- * All samples analyzed by the mTEC method.
- * Data run 2/13/2020.

COMMENTARY

Growing Area 13, the Great Salt Pond at Block Island, was sampled twelve (12) times during the 2019 season (11X during 2019 and 1X during January 2020), meeting minimum systematic random sampling requirements. Monitoring of Block Island shellfish growing waters was done through a cooperative agreement between the Town of New Shoreham Harbor Master's Office and DEM Water Resources. Following NSSP guidelines, statistics calculated for approved areas are based on the recent 30 samples and are representative of both wet and dry weather, with 13 wet weather and 17 dry weather samples. Similarly, statistics for seasonally approved areas are representative of both wet (n= 6) and dry (n= 9) weather conditions collected when the area was in the open status.

The 2019 statistical review demonstrated that all approved and conditionally approved stations in GA13 (Block Island Great Salt Pond) are in compliance. Comparison of results at the seasonally approved stations also demonstrated that seasonal closures are effective in maintaining acceptable water quality during the open season in GA13. The area is properly classified.

RECOMMENDATIONS

- * Continue cooperative agreement with Block Island Harbor Master to monitor Block Island shellfish growing areas.
- * No other actions recommended.

RIDEM SHELLFISH GROWING AREA MONITORING: GA13

Approved stations, recent 30 all weather.

(7/11/2017 to 1/28/2020; all mTEC, 13 wet and 17 dry weather)

FECAL-GEO

<u>Station Name</u>	<u>Status</u>	<u>N</u>	<u>MEAN</u>	<u>90th Percentile (<31 cfu/100 ml)</u>
GA13-9	A	30	3.4	10.4
GA13-10	A	30	2.1	2.8
GA13-11	A	30	2.0	2.7
GA13-13	A	30	2.4	5.2

Results for all observations at seasonally approved and prohibited stations (below) for reference only and not for compliance. Recent 30 all weather (7/11/2017 to 1/28/2020; all mTEC, 13 wet and 17 dry weather).

FECAL-GEO

<u>Station Name</u>	<u>Status</u>	<u>N</u>	<u>MEAN</u>	<u>90th Percentile (<31 cfu/100 ml)</u>
GA13-1	SA	30	5.9	24.1
GA13-2	SA	30	5.0	23.8
GA13-3	SA	30	3.2	10.7
GA13-4	SA	30	3.0	8.8
GA13-5	SA	30	2.7	6.8
GA13-6	SA	30	2.3	4.8
GA13-7	SA	30	2.7	7.0
GA13-8	SA	30	2.1	3.5
GA13-12	SA	30	2.6	6.4
GA13-14	SA	30	5.8	28.7
GA13-17	P	30	4.8	15.0

RIDEM SHELLFISH GROWING AREA MONITORING: GA13

Results for recent 15 samples at seasonally approved stations in seasonal closure areas A & C when station was open. Recent 15 samples (12/18/2017 or 1/24/2018 to 1/14/2020, 6 wet and 9 dry weather, all mTEC)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA13-1	SA	15	3.1	0.0
GA13-2	SA	15	2.6	0.0
GA13-3	SA	15	2.0	0.0
GA13-4	SA	15	2.1	0.0
GA13-5	SA	15	1.9	0.0
GA13-6	SA	15	1.9	0.0
GA13-7	SA	15	2.1	0.0
GA13-14	SA	15	2.7	0.0

Results for recent 15 samples at seasonally approved stations in seasonal closure area B when station was open. Recent 15 samples (12/18/2017 or 1/24/2018 to 1/14/2020, 6 wet and 9 dry weather, all mTEC)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA13-8	SA	15	1.9	0.0
GA13-12	SA	15	2.0	0.0

6. Summary and Conclusions

The 2019 review documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area. The 2019 review of fecal coliform water quality data indicated that all stations in Growing Area 13 met NSSP criteria while in the open status.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

Growing Area 14E and 14W

RI Offshore Waters

2019 Annual Update

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Growing Area 14E and 14W

RI Offshore Waters

2019 Annual Update

1. Introduction

Growing Area 14 is the waters off the southern cost of Rhode Island including the offshore waters around Block Island. The growing is broken into an eastern section, GA14E (Figure 1) and GA14W (Figure 2) which includes the offshore waters around Block Island. Most of the area is far from potential human impacts on microbial water quality and is therefore classified as remote. A 12-year sanitary shoreline survey of the Offshore Growing Area 14E, 14W was conducted in 2018. This survey reviewed the previous 2006 survey and compiled all the sources that were previously identified along with new sources located during the 2018 survey. There were two hundred ninety-two (292) actual or potential pollution sources identified between the two surveys. Twenty-six (26) of the sources previous identified in 2006 could not be located again in 2018, leaving 266 potential sources that were located and investigated during the 2018 survey. 155 of the potential sources were not flowing and 111 potential sources were flowing at the time of the 2018 survey. Of these flowing sources, 82 had flows too small to measure (trickle or less) or were in locations too hazardous to sample (steep cliffs).

Figure 1: 2019-2020 Shellfish Classification Map GA 14E

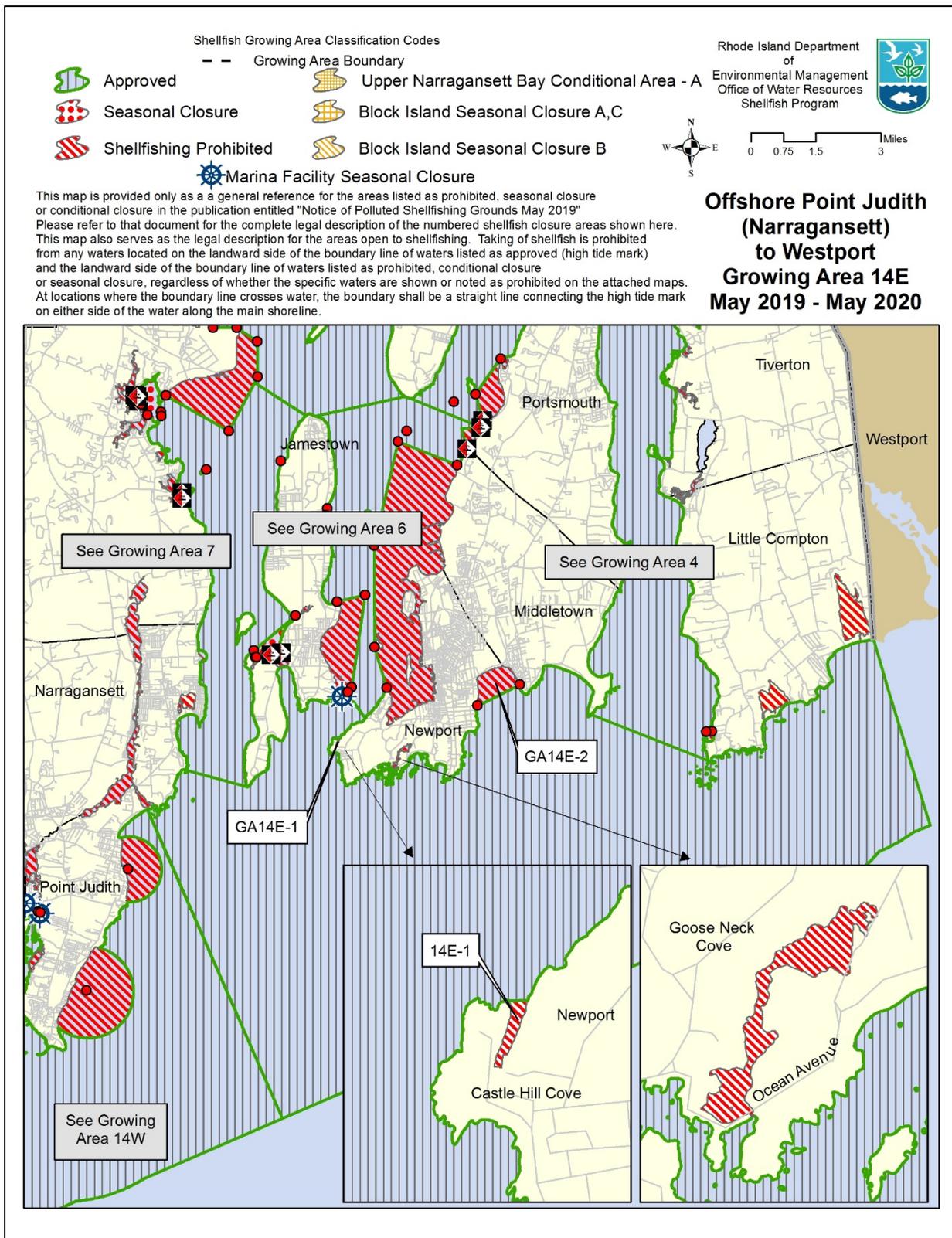
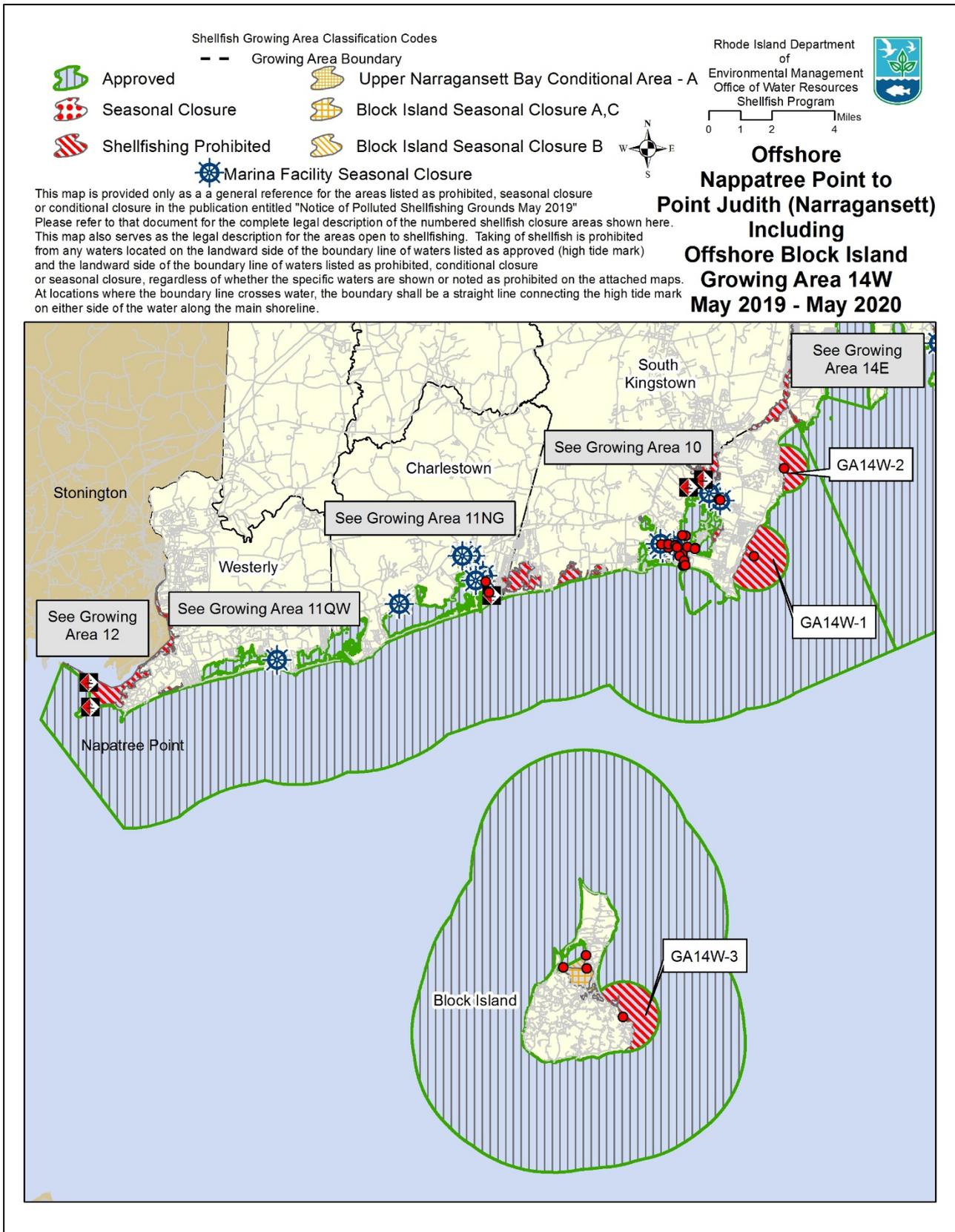


Figure 2: 2019-2020 Shellfish Classification Map GA 14W Offshore



2. 2019 Survey

An annual update of GA14 was completed during 2019. Four (4) sources were visited and resampled during 2019 (Table 1; Figure 3). One (1) of these sources had no flow. The remaining three (3) of the sources were sampled. All three (3) samples yielded bacteria results less than 240 cfu/100ml, which do not require immediate follow-up sampling. Source 2019-14E-200B, a groundwater seep, had a trickle flow and a fecal coliform result of <100 cfu/100 ml (Table 1). Source 2019-14E-300A, a small stream that dissipated through the sand before reaching the growing area, had a result of 100 cfu/100 and a trickle flow on 8/15/2019 9 (Table 1). Source 2019-14W-1302, a seep at Mohegan Bluffs on Block Island, had a trickle flow and a fecal coliform concentration of 180 cfu/100 ml 9 (Table 1). When source 2019-14W-1327 (a small groundwater seep) was visited for the 2019 update it had no flow. The potential sources sampled in the 2019 update were all of low fecal coliform concentration and had low flow. These sources (Table 1) do not have a significant effect on the microbial water quality of Growing Area14.

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

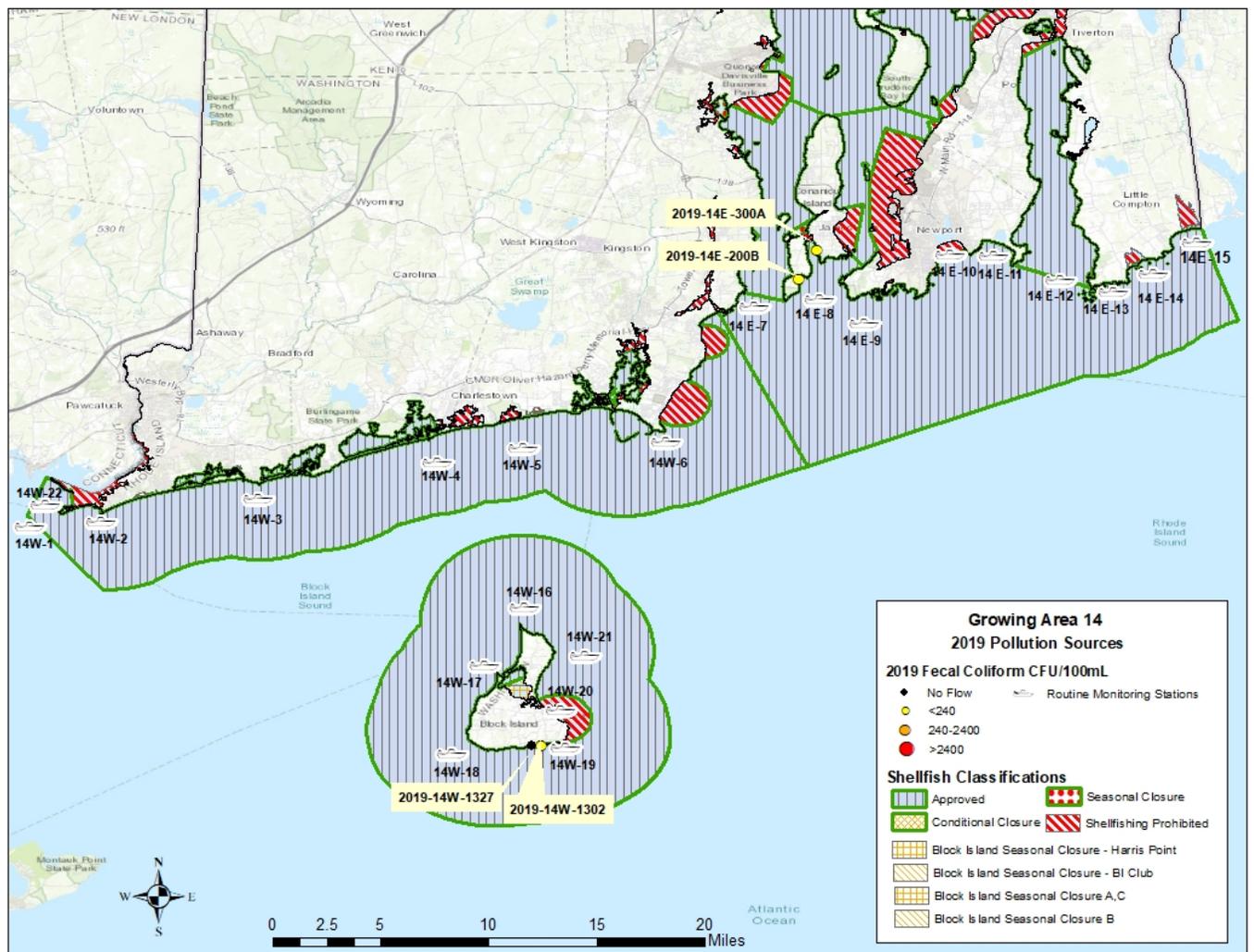
At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Growing Area 14E and 14W due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

Table 1: 2019 Summary of Potential Pollution Sources for GA 14 Offshore

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2018 mTEC cfu/100 ml	2019 Results mTEC cfu/100ml	2019 Volumetric Flow (cfs)
2019-14E-200B	8/15/2019	41.46286	-71.38984	GW seep spanning 20' along rock edge next to stairwell	Approved	A	D	2,800	<100	Trickle
2019-14E-300A	8/15/2019	41.48269	-71.37796	stream source. Does reach the water, very low flow	Approved	A	D	80,000	100	Trickle
2019-14W-1302	9/17/2019	41.1502	-71.5631	Flow from bluffs- reaches high tide line, behind 807 Mohegan Trail	Approved	A	D	5,000	180	Trickle
2019-14W-1327	9/17/2019	41.14947	-71.56894	GW stream, between 1082 and 1686 Mohegan Trail. Off bluffs	Approved	P	D	80,000	NF	NF

IS = In stream sample NS = Not sampled NF = No flow DNE = Does not exist

Figure 3: 2019 Pollution sources sampled during 2019 update.



3. Marina and Mooring Areas

There is a total of five (5) marinas, two in the offshore waters of Block Island and three in GA14E. The waters surrounding all these marinas are classified as prohibited or have seasonal (summer) closures with sufficient dilution waters to be protective of adjacent shellfishing waters. Details of the marina dilution calculations can be found in the report entitled “Marina Dilution Analysis June 2017” and in the electronic excel file 2017 Marina Calcs VIMC FDA located in the program’s permanent files.

4. Wastewater Treatment Facilities

The watershed adjacent to the offshore growing area is a mix of undeveloped beaches, rocky cliffs, small seasonal communities and other residential uses. There are no industrial or large commercial areas adjacent to approved offshore waters.

The Rhode Island Pollution Discharge Elimination System Program (RIPDES) is responsible for permitting all industrial and municipal waste discharges to waterbodies of the state. The RIPDES Program has documented and permitted three (3) wastewater treatment facilities that discharge into GA14. All WWTF have prohibited safety zones established around their outfalls. The size of these prohibited safety zones was developed to be protective of adjacent shellfish waters using the EPA PLUMES dilution and dispersion model program. The three (3) WWTF discharging to GA14 are:

<u>Facility</u>	<u>Location</u>	<u>Permit Flow</u>	<u>2019 Avg. Flow</u>
Scarborough WWTF	Narragansett	1.4 MGD	0.77 MGD
South Kingstown WWTF	S. Kingstown	5.0 MGD	2.89 MGD
New Shoreham WWTF	New Shoreham	.45 MGD	0.12 MGD

The Scarborough WWTF had a 2019 average flow of 0.77 MGD which was well below the permitted flow of 1.4 MGD. A review of EPA ECHO DMR data indicated that the Scarborough WWTF had no flow or fecal coliform concentration permit violations during 2019. The South Kingstown WWTF had an average flow of 2.89 MGD during 2019 compared to a permitted flow of 5.0 MGD. The South Kingstown WWTF had no flow or fecal coliform violations during 2019. The New Shoreham (Block Island) WWTF had an average flow of 0.11 MGD during 2019 maximum flow of 0.30 MGD during August 2019 compared to a permitted flow of 0.45 MGD. The New Shoreham WWTF had no flow or fecal coliform violations during 2019. The 2019 review of GA14 WWTF indicates that these facilities are well-run and are discharging treated effluent within the permitted flow and fecal coliform limits.

Table 2. 2019 OWTS Complains in GA 14

Address	Town	Date	Complaint	Location in relation to GA	OC&I Action
27 BREACH DR	WESTERLY	5/20/2019	Cesspool phaseout, Failed to comply with hardship extension	On Weekapaug Breachway	Inspected, no violation found
30 HARBOR DR	WESTERLY	6/26/2019	Property has a cesspool and is subject to the cesspool phaseout act.	On Winnipaug Pond	Inspected, Citation and Notice of Violation issued, cesspool not replaced
Breachway	WESTERLY	8/7/2019	Sewage odors; not quite sure where they are coming from.	Breachway	Inspected, no violation found

5. Water Quality Studies

RIDEM Shellfish Program

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at twenty-one (21) monitoring stations throughout the growing area. There are nine (9) monitoring stations in GA14E of which eight (8) are Approved and one is classified as Prohibited (Figure 4). There are thirteen (13) monitoring stations located in GA14W of which twelve (12) are classified as Approved and one (1) is classified as Prohibited (Figure 5).

Samples are collected 1-2 feet below the water surface using 125 ml (4-ounce) sterile Nalgene bottles after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics were analyzed by the mTec method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

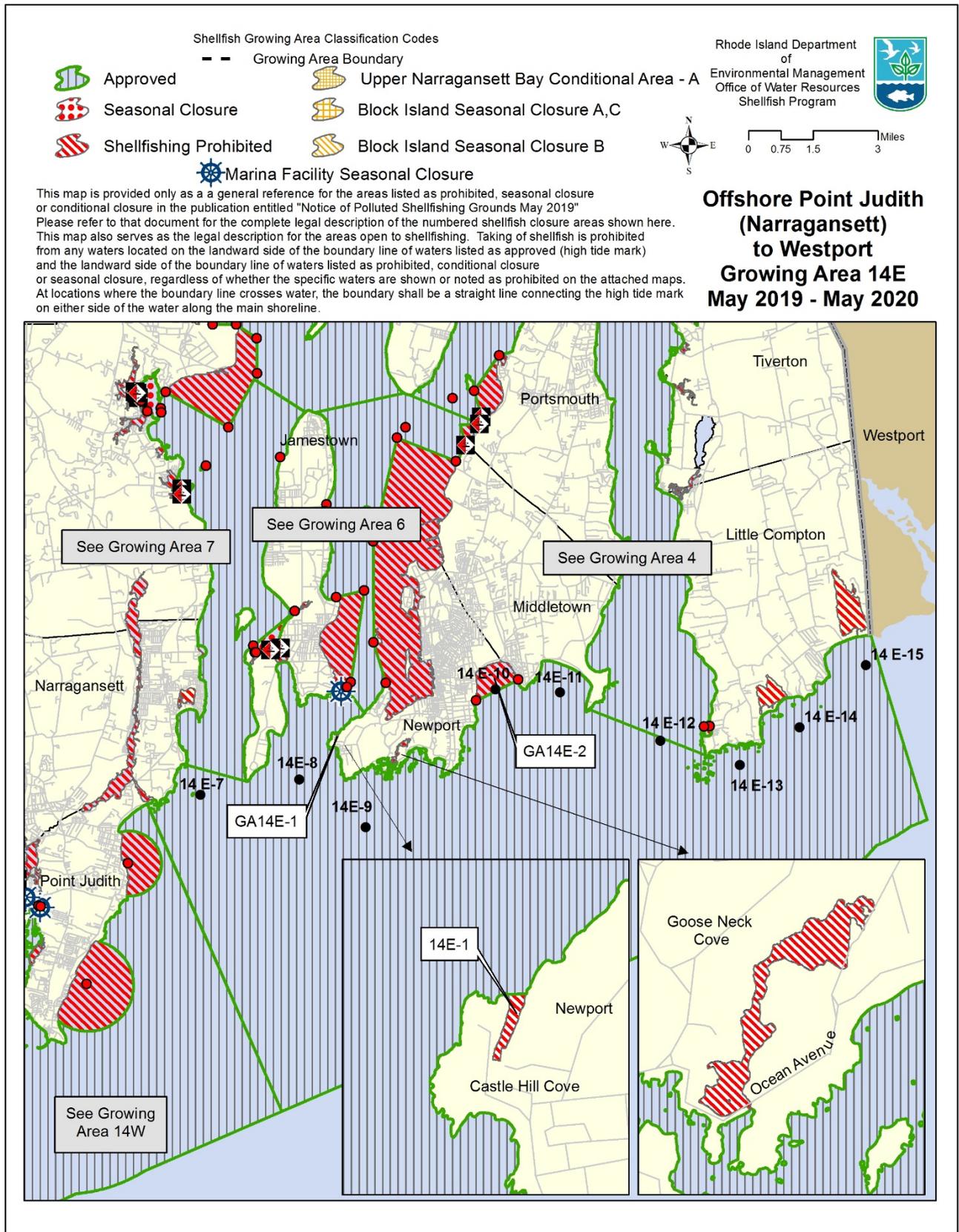


Figure 4: GA14E 2019-2020 Classification map with routine monitoring stations

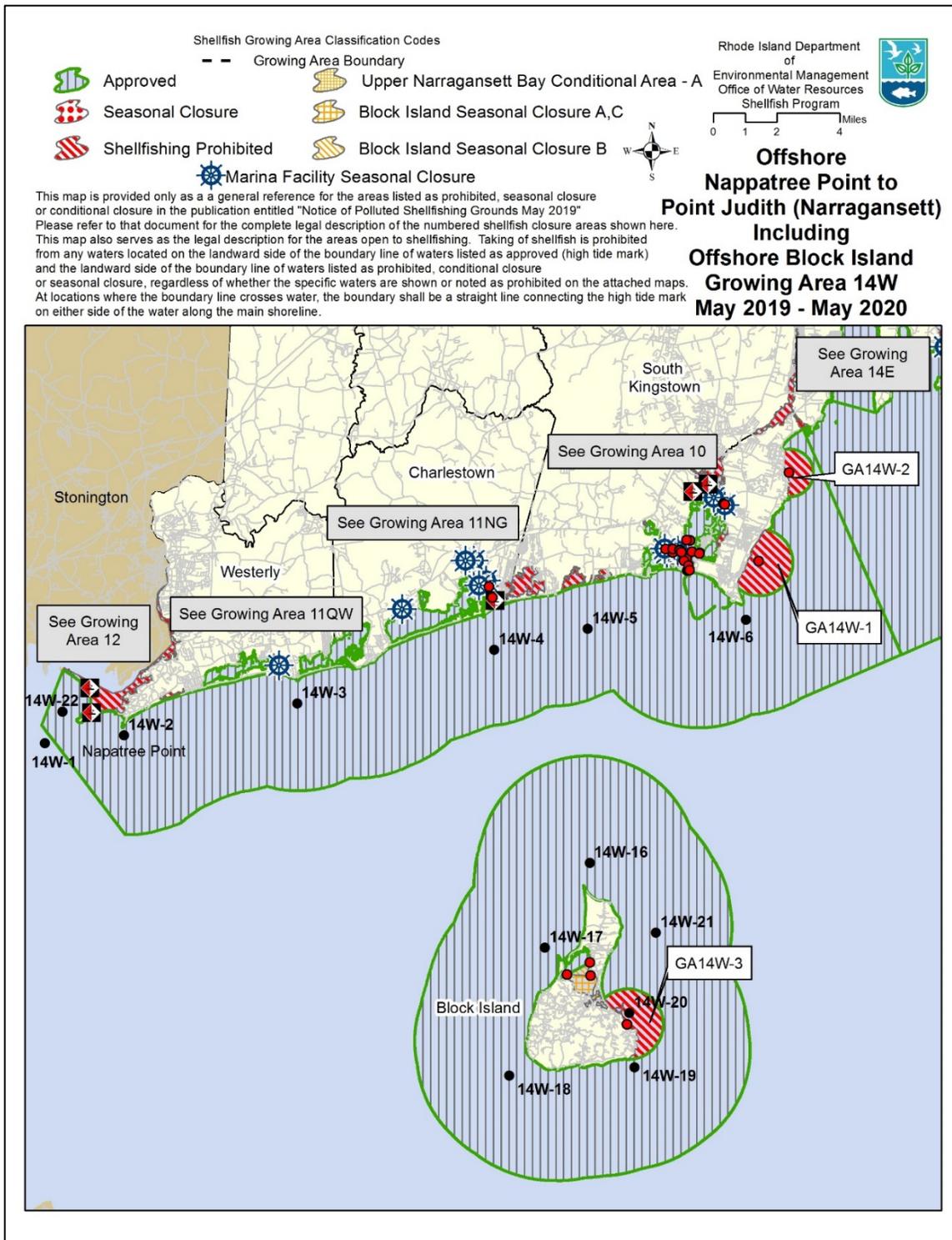


Figure 5: GA14W 2019-2020 Classification map with routine monitoring stations

2019 Review and Statistical Summary of Growing Area 14:

HIGHLIGHTS

- * Sampled 2X during 2019.
- * Area is remote in status.
- * Statistics represent all data collected 6/11/2012 to 11/20/2019 (GA14-E); 6/11/2012 to 9/19/2019 (GA14-W) and 9/18/2012 to 10/24/2019 (GA14-BI).
- * mTEC = 14 sets of samples and MPN = 1 set of samples for areas 14E and 14W. Area 14BI = all mTEC.
- * Variability criteria adjusted to 32 cfu/100 ml (14 mTEC, 1 MPN) in GA14E and GA14W.
- * All stations in program compliance.
- * Data run 12/17/2019.

COMMENTARY

The coastal offshore areas of Rhode Island (Growing Area 14) along the south coast of the mainland and the waters around Block Island are considered remote in status due to their distance from land-based point- and non-point sources of fecal coliform contamination. A twice per year sampling program of these areas was begun in 1994, consistent with NSSP guidelines for the monitoring of remote areas. Stations 14-1 to 14-15 and 14-22 along the RI coast from the Connecticut to Massachusetts borders were sampled twice during 2019 in a collaborative effort between DEM Water Resources and DEM Enforcement. Waters around Block Island (stations 14-16 to 14-21) were monitored twice during 2019 in collaboration with the Town of New Shoreham Harbor Master's Office.

The statistical evaluation included the most recent 15 samples dating back to 2012. Samples were analyzed by a combination of MPN (n= 1) and mTEC (n= 14) methods which, per NSSP guidance, required an adjustment in the variability criteria to 32 cfu/ 100 ml. Fecal coliform concentration in the offshore waters is consistently low (2 cfu/100 ml or less), with only six (6) of the 330 observations (1.8%) in the recent data set exceeding the 2 cfu/100 ml detection limit.

The 2019 statistical evaluation demonstrated that all stations in the offshore area (GA14) meet criteria and are in program compliance. The area is properly classified.

RECOMMENDATIONS

* Continue collaborative efforts to monitor GA14 offshore remote waters.

* No other actions recommended based on ambient monitoring results.

RIDEM SHELLFISH GROWING AREA MONITORING: GA14

GA14E, Recent 15 all weather.

(6/11/2012 TO 11/20/2019; 14 mTEC and 1 mpn)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 32 cfu/100 ml</i>
GA14E-7	A	15	2.0	0.0
GA14E-8	A	15	2.2	0.0
GA14E-9	A	15	2.0	0.0
GA14E-10	P	15	2.0	0.0
GA14E-11	A	15	2.0	0.0
GA14E-12	A	15	2.0	0.0
GA14E-13	A	15	2.0	0.0
GA14E-14	A	15	2.0	0.0
GA14E-15	A	15	2.0	0.0

GA14W, Recent 15 all weather.

(6/11/2012 TO 11/20/2019; 14 mTEC and 1 mpn)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 32 cfu/100 ml</i>
GA14W-1	A	15	2.0	0.0
GA14W-2	A	15	2.0	0.0
GA14W-3	A	15	2.0	0.0
GA14W-4	A	15	2.0	0.0
GA14W-5	A	15	2.2	0.0
GA14W-6	A	15	2.0	0.0
GA14W-22	A	15	2.1	0.0

GA14W, Block Island offshore stations, Recent 15 all weather.

(9/18/2012 to 10/24/2019; all mTEC)

<i>FECAL-GEO</i>				
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 32 cfu/100 ml</i>
GA14W-16	A	15	2.0	0.0
GA14W-17	A	15	2.0	0.0
GA14W-18	A	15	2.0	0.0
GA14W-19	A	15	2.0	0.0
GA14W-20	P	15	2.0	0.0
GA14W-21	A	15	2.0	0.0

6. Summary and Conclusions

The 2019 review documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area. The three (3) WWTF discharging treated effluent to the growing area were in compliance with permitted fecal coliform loading during 2019. The 2019 review of fecal coliform water quality data indicated that all monitoring stations in the growing area meet NSSP criteria while in the open status.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

Growing Area 15

Seekonk River

2019 Annual Update

All waters of the Seekonk River, Growing Area 15, are currently prohibited to shellfishing. The area was not sampled in 2019. The area has historically been closed to shellfish harvesting because of consistently elevated fecal coliform levels, and the area's proximity to a large urban environment. The area is properly classified as prohibited.

HIGHLIGHTS

- * Area was not sampled during 2019
- * Harvest of shellfish is prohibited in Growing Area 15.
- * Last sampled in 2008.
- * Summary statistics not updated for 2019.

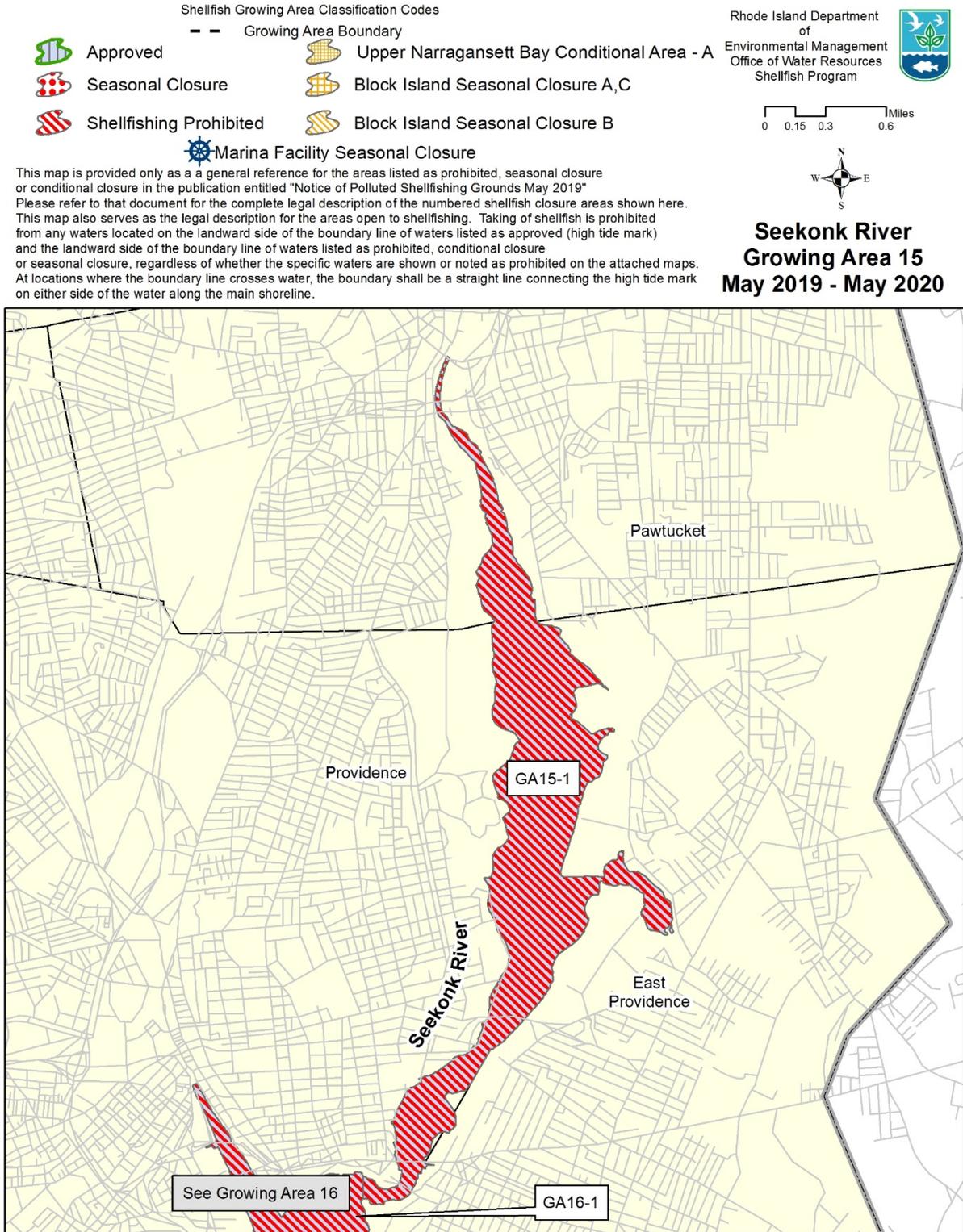
COMMENTARY

The Seekonk River (Growing Area 15) was not sampled during 2019. The area is classified as prohibited for the harvest of shellfish, so there is no minimum sampling requirement. The area is largely urban and has historically been prohibited for the harvest of shellfish because of consistently elevated fecal coliform levels. Sampling Growing Area 15 is a very low priority for the Shellfish Program because of its prohibited status.

RECOMMENDATIONS

- * Dependent on staff resources, sample the Seekonk River (Growing Area 15) at least once per year to monitor recent fecal coliform conditions.
- * Continue to assess other water quality data collected in the Providence River, such as Narragansett Bay Commission water quality data (<https://snapshot.narrabay.com/>), to evaluate water quality trends in the growing area.
- * No action recommended based on ambient monitoring results.

Figure 1. 2019-2020 Shellfish Classification Map GA15 (Seekonk River).



GA16 Providence River 2019 Annual Update

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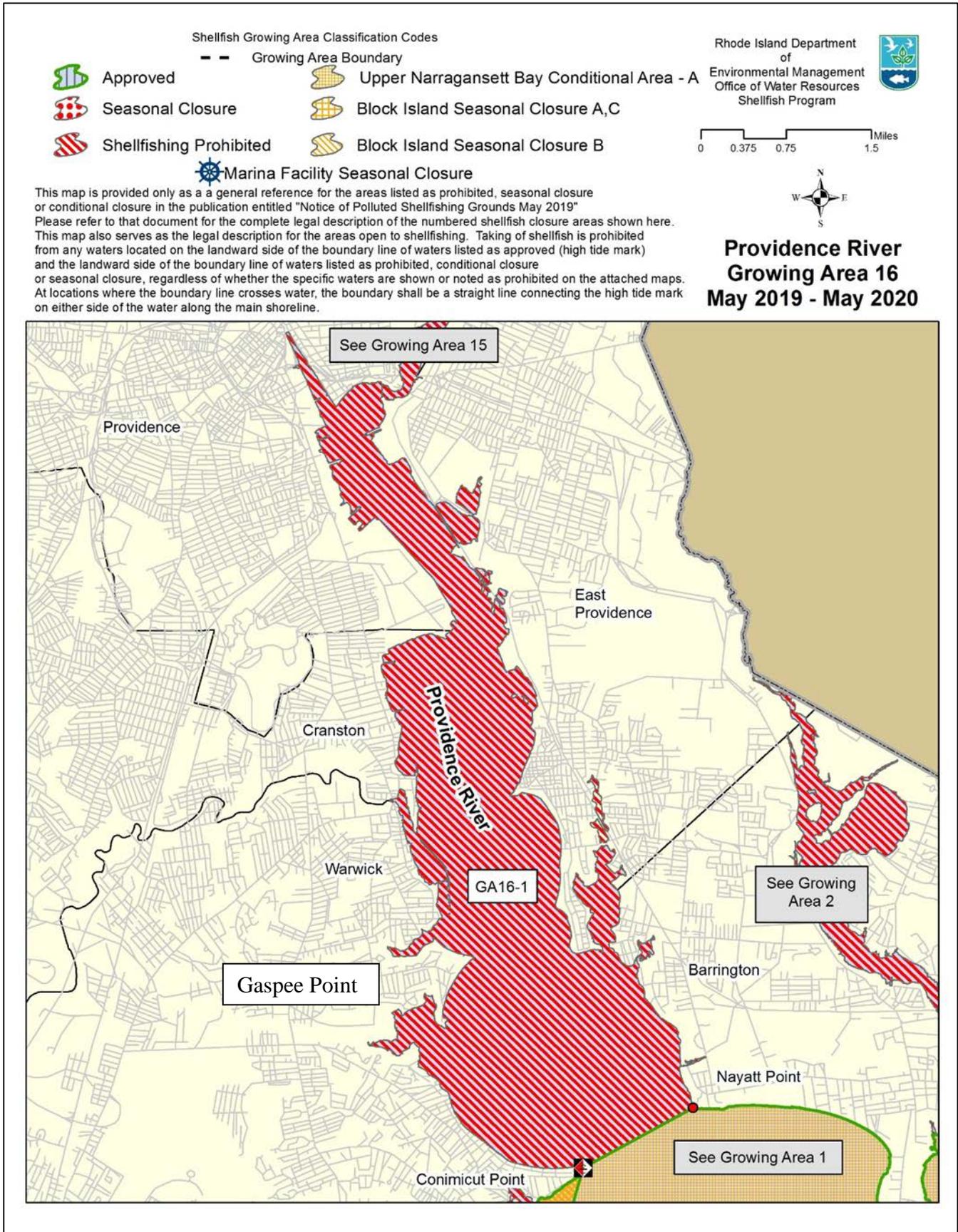
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A. Introduction

A 12-year sanitary survey of the lower Providence River (area south of Gaspee Point to Conimicut Point, Figure 1) was completed in 2009 and a triennial update of this area was completed in 2017. Three (3) sources exceeded the 240 fc/MPN threshold during the 2017 survey. The 2019 survey involved follow-up sampling on previously identified elevated sources (Table 1) and a reconnaissance of the entire study area to identify and sample pollution sources from all actively flowing sources to assess impacts on the Providence River Shellfish Growing Area.

Figure 1: Current Growing Area 16 Classification Map & monitoring station locations.

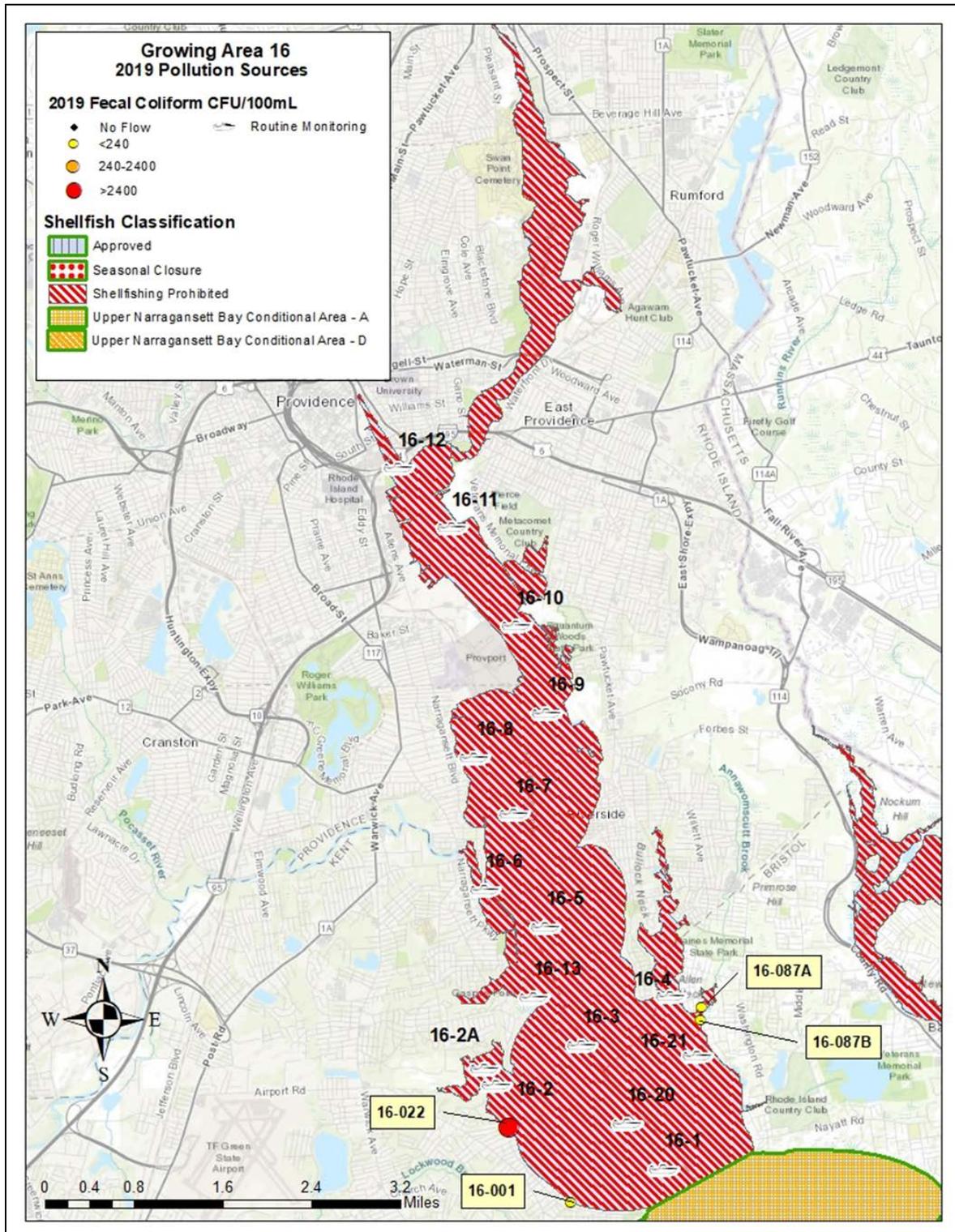


This map is provided only as a general reference for the areas listed as prohibited, seasonal closure or conditional closure in the publication entitled "Notice of Polluted Shellfishing Grounds May 2019". Please refer to that document for the complete legal description of the numbered shellfish closure areas shown here. This map also serves as the legal description for the areas open to shellfishing. Taking of shellfish is prohibited from any waters located on the landward side of the boundary line of waters listed as approved (high tide mark) and the landward side of the boundary line of waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

B. 2019 Shoreline Survey

An annual update survey of the southern portion of the Providence River growing area (GA16) was conducted on 12/27/19 by staff from RIDEM's Office of Water Resources Shellfish Program. The 2019 annual update survey took place during dry weather (13 days since 1.93" rain at TF Green Airport, KPVD).

Figure 2: Map of sources examined during 2019 shoreline survey of the lower Providence River.



Source 16-001 (Figure 3) is located on the western side of the growing area just north of Conimicut Point. Source 16-001 is a 24” reinforced concrete pipe that discharges onto the shoreline near the northern extension of Symonds Avenue. The flow then crosses the narrow beach in a shallow seep (24” wide by < 1” deep). When sampled the pipe was approximately 50% filled with gravel and sand, considerably decreasing its potential flow rate. When sampled on 12/27/2019, the flow was a trickle and a fecal coliform concentration of <100 cfu/100 ml was observed. This source flows into waters that are currently classified as prohibited.



Figure 3: Source 16-001

Source 16-022 (Figure 4) is a small stream (approximately 1 foot wide) that drains a vegetated area near the end of the northeast extension of Rock Avenue in Warwick, RI. On 12/27/2019, the fecal coliform level was 6,700 cfu/100 ml in the trickle/stream as it crossed the beach. Most of the flow dissipated into the sand before reaching the receiving waters. In 2018, an in-stream sample in the nearby receiving waters yielded a fecal coliform result of <100 cfu/100 ml indicating rapid dilution of this source in the receiving waters.



Figure 4: Source 16-022

Source 16-087A (Figure 5) is the tidal stream at the seaward end of Allin’s Cove in Barrington, RI. This tidal stream connects the estuarine waters and fringing salt marsh of Allin’s Cove with the receiving waters of the lower Providence River (GA16). A small creek Annawamscutt Brook, discharges freshwater to Allin’s Cove (also known as Drown Cove). Allin’s Cove has undergone salt marsh restoration and erosion control efforts during 2003-2004

(<http://www.edc.uri.edu/restoration/html/intro/stories.htm>) in an effort to improve habitat conditions in the area. A sample collected at the mouth of this tidal stream during ebb tide yielded a fecal coliform result of 40 cfu/100 ml on 10/22/2018 and <100 cfu/100 ml on 12/27/2019. The receiving waters of GA16 are classified as prohibited to shellfish harvest.



Figure 5: Source 16-087A

Source 16-087B is a concrete pipe that is buried in the sand on the beach at the northern end of Willow Way in Barrington, RI. The opening of the pipe is completely buried by sand, but a trickle of flow was visible in the vicinity of the buried pipe. When sampled on 10/22/2018, source 16-087B had a flow of approximately 0.04 cfs and a fecal coliform concentration of 340 cfu/100 ml. When sampled on 12/27/2019 the source had a fecal coliform concentration of 100 cfu/100 ml. The flow from this source was dissipating into the sand before reaching the receiving waters when sampled at low tide but would reach the receiving waters at high tide. Given the low flow, the fact that the flow percolates through sand, and that the receiving waters are classified as prohibited to shellfish harvest, this source is currently not impacting approved waters.

While the waters of GA16 are currently classified as Prohibited, the RI DEM Shellfish Program has consistently collected data at several stations within the southern portion (Gaspee Point south to Conimicut Point) of the growing area. This monitoring effort is to track water quality trends in the area in response to improved wastewater and stormwater treatment and supports future classification decisions for the growing area. A review of these growing area data indicate that the shoreline sources identified during the 2019 survey have minimal impact on the growing area during dry weather (less than 0.5" rain in prior seven days). For example, at station 16-2 on the west side of GA16 (Figure 2) a geometric mean of 3.4 cfu/100 ml and 0% of the samples exceeded 31 cfu/100 ml for the recent 15 samples (see water quality section). Similarly, station 16-4 on the west side of the southern portion of GA16 had a dry weather geometric mean of 3.8 cfu/100 ml and 0% of samples exceeded 31 cfu/100 ml. The water column monitoring results support that these sources do not negatively impact the fecal coliform water quality during dry weather (<0.5" rain in prior 7 days).

Table 1: Summary of GA16 pollution sources sampled in 2019 update

Source ID	Date Visited	Latitude	Longitude	Description	Receiving waters classification	Actual / Potential	Direct / Indirect	2017 Results mTEC cfu/100ml	2018 Results mTEC cfu/100ml	2019 Results mTEC cfu/100ml
16-001	12/27/2019	41.7186	-71.3708	24" RCP	Prohibited	Actual	Direct	160	880	<100
16-022	12/27/2019	41.7283	-71.38174	Stream (1' wide by 8" deep) drains onto marshy beach, upstream is covered in vegetation, address- end of Rock Ave	Prohibited	Actual	Direct	160	1,000	6,700
16-087B	12/27/2019	41.7424	-71.34822	Appears to be outfall running through cement slab. Filled all the way with sand except for 2" on the top. Located below high tide line	Prohibited	Actual	Direct	NS	340	100
16-087A	12/27/2019	41.744	-71.34797	CMP in corner of beach partially submerged	Prohibited	Actual	Direct	140	40	<100

C. Marinas

The Providence River leads to New England's second largest deep-water port, with thousands of vessels a year traveling through these waters transporting goods to and from Rhode Island. In addition, hundreds of recreational vessels of various sizes use these waters for their enjoyment. There is a total of eighteen (18) marinas located within Growing Area 16 and the upstream Seekonk River. Currently all waters of GA16 are classified as prohibited. In addition, none of the marinas in GA16 are located in waters south of Gaspee Point being which is the area under evaluation for reclassification.

Details of these marinas can be found in the shellfish program's document entitled "Evaluation of Waters Adjacent to Marinas – Marine Dilution Analysis Background June 2017". Waters adjacent to these marinas have either a year-round prohibited area or a seasonal closure to be protective of shellfish waters should an accidental discharge from a vessel occur. All waters in Rhode Island are designated as No Discharge Zones which prohibits the discharge of any sewage from any vessel within any waters of the state. Information regarding the enforcement and inspection procedures for vessels operating in RI waters can be found on our website by following this link:

<http://www.dem.ri.gov/programs/water/shellfish/marine-pumpouts.php>

D. Wastewater Treatment Facilities

The Providence River receives wastewater discharges from seventy-nine (77) Rhode Island Pollutant Discharge Elimination Systems (RIPDES) permitted dischargers from Rhode Island and seventeen (17) from Massachusetts within the Providence River watershed. Ten (10) of these are major sanitary dischargers, four (4) are minor sanitary dischargers while the remaining sixty-four (64) in RI are non-sanitary dischargers. Figure 6 indicates the location of these facilities within RI and Table 2 details the design and average flow volumes of the sanitary facilities. Of a total of roughly 795 MGD of freshwater inputs from the numerous larger tributaries to the Providence River a quarter (199 MGD) of those flows can be attributed to the discharges from the listed permitted facilities. The majority of effluent from Rhode Island WWTF is discharged from either Narragansett Bay Commission's (NBC) treatment facilities at Field's Point and Bucklin Point. Most Massachusetts WWTF are miles upstream from GA16. For example, the Worcester WWTF is 75 km (47 miles) upstream from Gaspee Point in growing area 16.

A review of 2019 data indicated that the major WWTF in the Providence area had no significant violations of their NPDES discharge permits. The East Providence WPCF (RI0100048) reported no permitted discharge violations during 2019. Average 2019 flow at the East Providence facility was 6.9 MGD compared to a permitted flow of 14.2 MGD. The Narragansett Bay Commission Bucklin Point WWTF (RI0100072) reported a flow rate of 21.8 MGD during 2019 which is below the permitted 31 MGD limit. Fecal coliform in the treated effluent was variable but had a 2019 monthly average of 100 cfu/100 ml; mainly due to elevated fecal coliform during July, August and September of 2019. The Narragansett Bay Commission Field's Point WWTF reported no flow or fecal coliform violations during 2019. Average monthly flow through the WWTF was 46.5 MGD during 2019 compared to permitted flow of 65 MGD. Monthly average fecal coliform in the treated effluent was typically less than 10 cfu/100 ml during 2019. The 2019 review of GA16 WWTF DMR data demonstrated that the major WWTF in the Providence area were performing as designed and discharging well below permitted discharge flow and fecal coliform concentration levels.

Figure 6: Location of major and minor dischargers within the Providence River watershed.

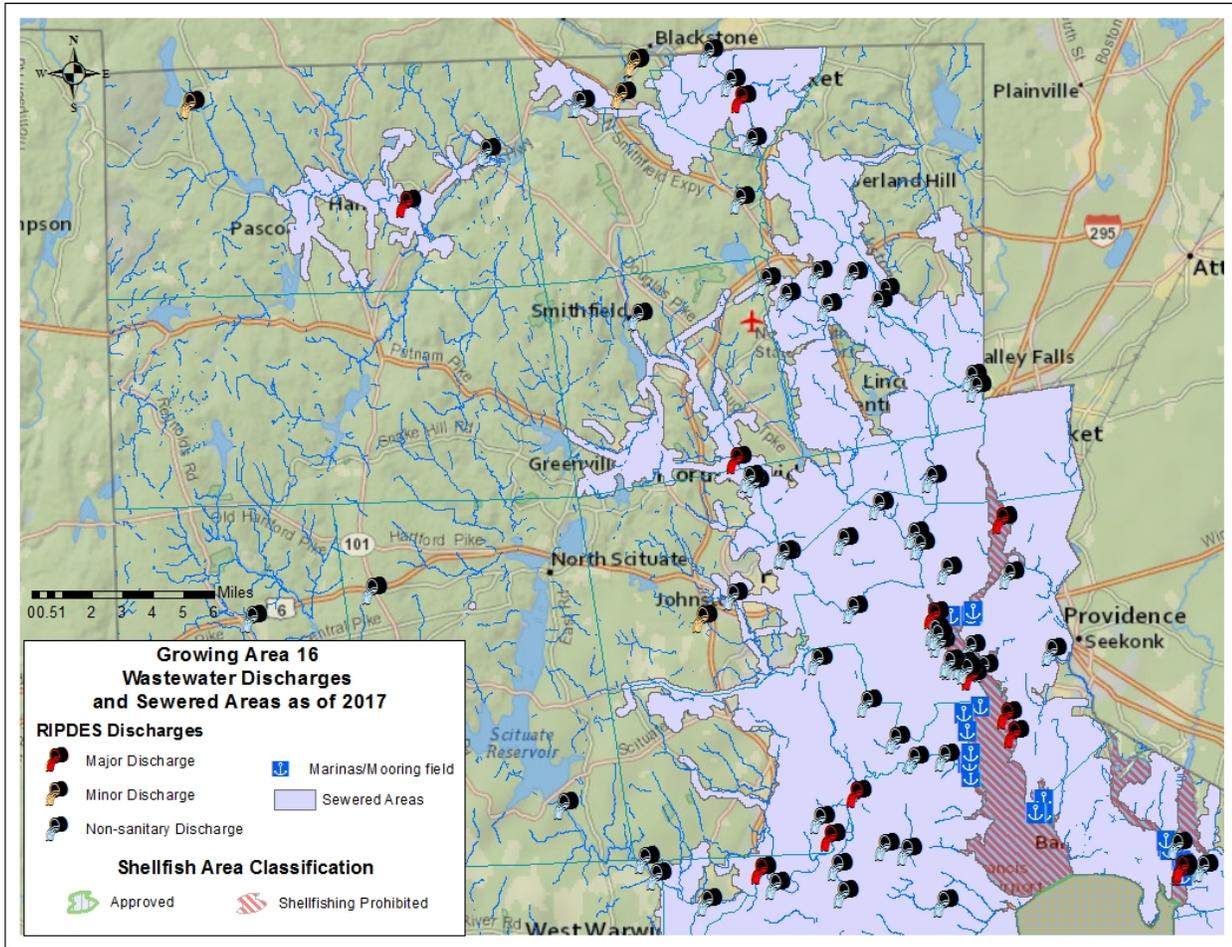


Table 2: Permitted Dischargers within the Providence River watershed

Facility Name	Major / Minor Sanitary Facility	Receiving Waters	Design Flows / Permitted Flows (MGD)	Average Daily Flows (MGD)
Rhode Island Facilities				
Woonsocket WWTF	Major	Blackstone River	16	9.3
Dart Industries Inc.	Minor	Blackstone River	UA	UA
Atlantic Thermoplastics	Minor	Branch River	UA	UA
Burrillville WWTF	Major	Clear River	1.5	0.7
Zambarano Hospital	Minor	Clear River	0.12	0.06
Medical Homes of RI	Minor	Dry Brook	UA	UA
Cranston WWTF	Major	Pawtuxet River	20.2	13.2
Warwick WWTF	Major	Pawtuxet River	7.7	4.5
West Warwick WWTF	Major	Pawtuxet River	7.9	5.2
NBC Fields Point WWTF	Major	Providence River	77	45.5
Exxon Mobil Shipping Terminal	Major	Providence River	0.95	UA
East Providence WWTF	Major	Providence River	14.2	6.7
NBC Bucklin Point WWTF	Major	Seekonk River	46	23.1
Smithfield Sewer Authority WWTF	Major	Woonasquatucket River	3.5	1.4
TOTAL			131.37	78.46
Massachusetts Facilities				
Upper Blackstone WWTF	Major	Blackstone River	77	UA
Grafton WWTP	Major	Blackstone River	2.4	UA
Uxbridge WWTF	Major	Blackstone River	1.25	UA
Millbury WWTP	Major	Blackstone River	1.2	UA
Northbridge WWTP	Major	Blackstone River	2	UA
Riverdale Mills	Minor	Blackstone River	0.3	UA
Worcester DPW CSOs	Minor	Blackstone River	350*	UA
Cumberland ENGRG Inc.	Minor	Blackstone River	0.07	UA
Wyman Gordon Worcester	Minor	Blackstone River	UA	UA
Lewcott Corp.	Minor	Blackstone River	0.011	UA
Hopedale WWTP	Major	Mill River	0.588	UA
Douglas WWTP	Minor	Mumford River	0.6	UA
Mantrose Haeuser Co.	Minor	Ten Mile River	0.65	UA
North Attleboro Nat'L Fish Hatchery	Minor	Ten Mile River	1.7	UA
Attleboro WPCF	Major	Ten Mile River	8.6	UA
North Attleboro WWTP	Major	Ten Mile River	4.61	UA
Upton WWTP	Major	West River	0.4	UA
TOTAL			80.38 or 430.38 with CSO	

*Permitted flow is for combined sewerage and stormwater

UA = Unavailable

E. Water Quality Studies / Annual Statistical Summary

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are routinely collected at six (6) monitoring stations in the southern portion (south of Gaspee Point) of Growing area 16 (stations 16-2, 16-2A, 16-3, 16-4, 16-20, 16-21). The entirety of Ga16 is currently classified as Prohibited, so all of these stations are located in Prohibited waters.

Water samples are collected 1-2 feet below the water surface using 125 ml (4-ounce) sterile Nalgene bottles after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics were analyzed by the mTEC method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 16

HIGHLIGHTS

- * Stations in the lower Providence River were sampled fifteen (15) times during 2019 under both wet (n= 7) and dry (n= 8) weather conditions.
- * Harvest of shellfish is prohibited in the Providence River (GA 16).
- * Statistics calculated for informational purposes only, not for compliance.
- * Recent 30 samples collected 11/9/2017 or 11/28/2017 to 12/27/2019.
- * Recent 15 dry weather samples collected 1/31/2018 to 12/27/2019.
- * All samples analyzed by mTEC method.
- * Data run 2/13/2020.

COMMENTARY

The southern portion of the Providence River (stations 16-2, 16-3, 16-4, 16-20, 16-21 and 16-2A in Growing Area 16) was sampled 15 times during 2019 under a variety of wet (n= 7) and dry (n= 8) weather conditions. While this area is currently classified as prohibited to shellfish harvest, the Shellfish Program monitors the area in conjunction with the Upper Bay (Growing Area 1) to assess changes in water quality in response to WWTP and storm water control (Narragansett Bay CSO tunnel) upgrades. Summary statistics for this shellfishing prohibited area were calculated for informational purposes.

The 2019 statistical update indicated that three of four stations in the area met NSSP criteria for the approved classification under all weather conditions. One station (16-3) exceeded NSSP criteria during wet weather. Statistical analysis was also completed under a conditionally approved scenario in which the area would be open for shellfish harvest only during dry weather (< 0.5" rain in prior 7-days). This

analysis indicated that for 2019 all six stations in the lower Providence River between Gaspee Point and Conimicut Point met NSSP criteria for conditionally approved waters if a 0.5", 7-day closure rain threshold was applied. 2019 marks the fourth straight year in which the lower Providence River has met NSSP criteria for conditionally approved waters if a 0.5" rain conditional closure is applied.

The area is properly classified as prohibited to shellfish harvest.

RECOMMENDATIONS

- * Continue to monitor lower Providence River under all weather conditions to evaluate potential reclassification.
- * Consider reclassifying the lower Providence River as conditionally approved with a 0.5" rain closure threshold and a 7-day closure duration.
- * No other actions recommended based on ambient monitoring results.

RIDEM SHELLFISH GROWING AREA MONITORING: GA16

Six stations in GA16 (Providence River) were evaluated under two potential management scenarios (below). The area is currently classified as prohibited. Statistics shown for informational purposes only, not for compliance.

Approved scenario:

Recent 30 all weather.

(11/9/2017 or 11/28/2017 to 12/27/2019; 15 wet and 15 dry, all mTEC)

FECAL-GEO

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>90th Percentile (<31 cfu/100 ml)</i>
GA16-2	P	30	5.8	27.7
GA16-3	P	30	6.8	40.2
GA16-4	P	30	6.0	22.7
GA16-20	P	30	4.4	22.9
*GA16-21	P	20	3.4	16.1
*GA16-2A	P	19	4.4	19.1

* Stations 16-21 and 16-2A sampled less than 30 times; statistics shown for comparative purposes only.

Conditionally Approved scenario:

Recent 15 dry weather only (<0.5" rain in previous 7 days) only.

(1/31/2018 to 12/27/2019, all mTEC)

FECAL-GEO

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA16-2	P	15	3.4	0.0
GA16-3	P	15	2.8	0.0
GA16-4	P	15	3.8	0.0
GA16-20	P	15	2.7	0.0
GA16-21	P	15	2.4	0.0
GA16-2A	P	15	3.3	0.0

F. Summary and Conclusions

The 2019 review documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area based on the current classification, however should the area be reclassified to conditionally approved sources will need to be reevaluated for any impacts during dry weather conditions. The WWTF discharging treated effluent adjacent (up river) to the growing area were in compliance with permitted fecal coliform loading during 2019. The 2019 review of fecal coliform water quality data indicated that all monitoring stations in the growing area meet NSSP during dry weather conditions (<0.5” rain in prior 7 days).

The 2019 update has demonstrated that the area is properly classified and that the area south of Gaspee Point and north of Conimicut Point could support a classification change to Conditionally Approved with a 0.5”, 7-day duration rain closure.

G. Literature cited

RI DEM, 2007. Total Maximum Daily Loads for Phosphorus to Address 9 Eutrophic Ponds in Rhode Island. Final TMDL Plan date 09/2007. 173 pages.

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Whitin, S. and Twohig, T. 2007 Restoration of Mussachuck Creek and RI Country Club – A federal and private partnership. ASCE World Environmental and Water Resources Congress 2007.

GA17 Mt. Hope Bay Annual Update 2019

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1. Introduction

A 12-year sanitary survey of Mount Hope Bay was conducted during August of 2014 by staff from RIDEM's Office of Water Resources Shellfish Program. The survey included a shoreline reconnaissance of the study area to locate and catalog pollution sources and collect bacteriological samples from all sources actively flowing into the survey area.

A triennial re-evaluation of this growing area was completed in 2017. As such, the 2019 annual update survey involved review of previous sanitary surveys followed by bacteriological sampling of actual pollution sources noted in previous surveys that were found to be equal to or greater than 240 FC/100ml and identification of any new sources of pollution if applicable. These previously identified pollution sources were re-evaluated to determine their bacteriological impacts on Mount Hope Bay.

The Mount Hope Bay - Growing Area 17 is presently managed as a conditionally approved shellfish growing area. There are 16 routine monitoring stations located throughout the growing area between the state line of Massachusetts to the north and the Bristol Point / Arnold Point line and the Sakonnet River Bridge line to the south. Management of GA17 runs concurrently with management of the conditionally approved Kickemuit River (GA5) that is contiguous with the northwestern corner of Mt. Hope Bay.

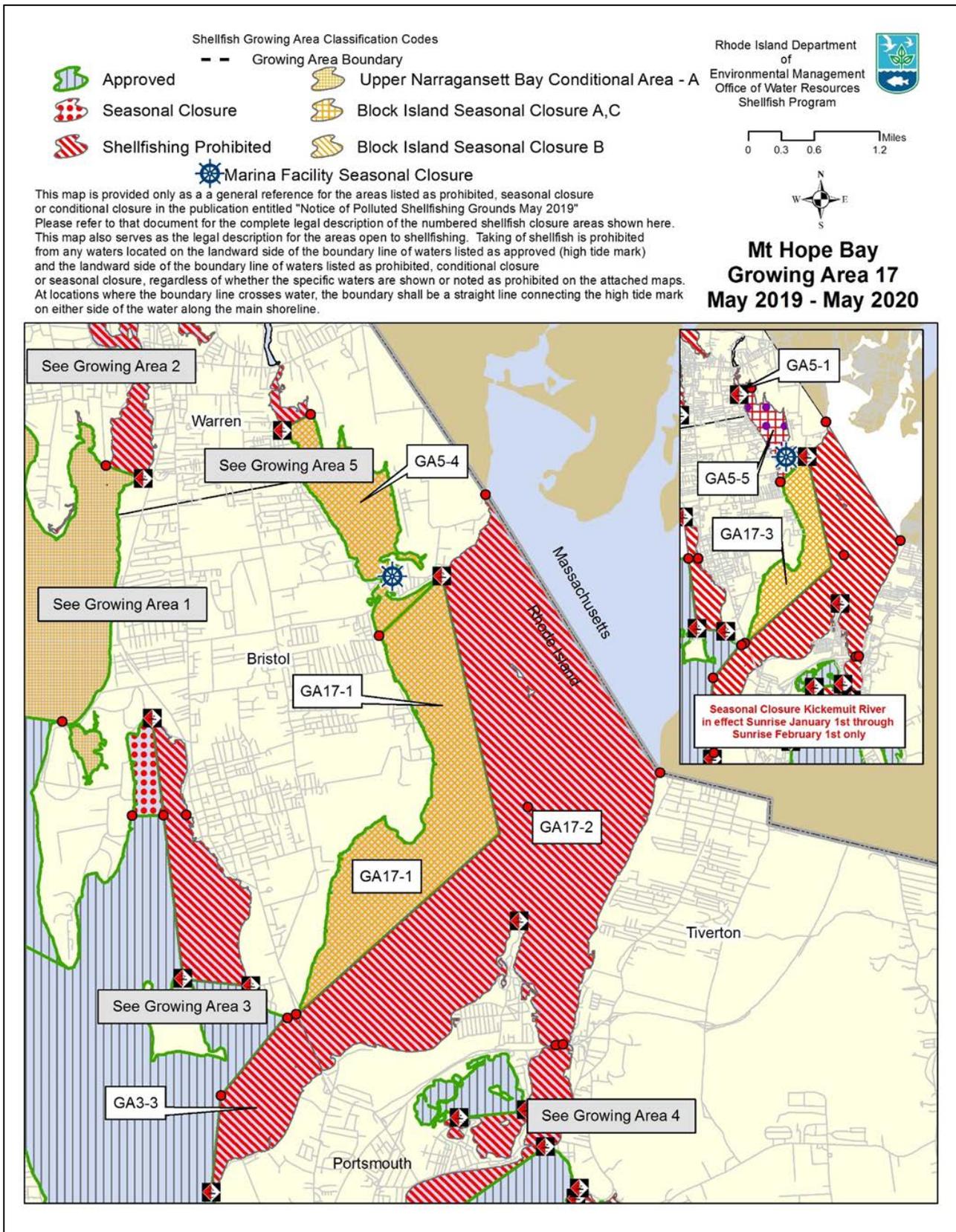
Mt. Hope Bay forms the northeast corner of Narragansett Bay, lying within both Rhode Island to the south and west and Massachusetts to the north and east. The southwest limit of the growing area is bounded by a line that parallels the Mt Hope Bridge from Bristol Point to Portsmouth. The southeast limit is the Sakonnet River Bridge. The northwest limit abuts the Kickemuit River Growing Area (GA5) just outside the mouth of the river, and the northeast limit is the state line traversing the Bay between Rhode Island and Massachusetts. Mount Hope Bay adjoins the East Passage of Narragansett Bay at the southwest corner of Mt. Hope Bay near the Mt. Hope Bridge and adjoins the Sakonnet River near the Sakonnet River Bridge. There are five major freshwater inputs to the Bay. The Taunton River is the largest freshwater source; others include the Quequechan River, which discharges into the Bay from the north along with the smaller Kickemuit, Cole and Lee Rivers.

Growing Area 17 is presently comprised of sections classified as either prohibited or conditionally approved for shellfishing (Figure 1). This divide in classification runs generally north to south with the conditionally approved area being along the town of Bristol shoreline. The prohibited area has been established as a closed safety zone due to discharges from WWTF in the Massachusetts portion of the watershed. The conditionally approved portion of the growing area is managed as a rainfall triggered closure with 0.5" of rain or greater requiring a minimum 7-day closure. The precipitation that initiates the shellfishing closures can be in the form of rain and/or snowmelt. All precipitation totals are based on the total accumulation during any consecutive 24-hour period (24 hr. total) as recorded at the NOAA Taunton weather station (KTAN).

The following information describes the physical geography of the Mt. Hope Bay (GA17) growing area.

Area of Shellfishing Prohibited in Mt. Hope Bay	4246.8 acres
Area of Conditionally Approved waters	1508.4 acres
Longest reach	5.0 miles
Widest reach	2.6 miles
Deepest point	75 feet

Figure 1: Mount Hope Bay (GA17) current classification



2. 2019 Shoreline Survey

A triennial update of the Mt Hope Bay Growing Area 17 was conducted in 2017 and a sanitary survey of pollution sources in GA17 was completed by RIDEM Office of Water Resources Shellfish staff on July 2, 2019. The survey involved review of previous sanitary surveys and sampling of actual pollution sources with bacteriological results greater than 240 cfu/100ml as well as identification of any new sources of pollution if applicable (Figure 3) that discharge to conditionally approved waters. The source bacteriological results from this survey are presented (Table 1) and a map showing the locations of all sources is presented (Figure 3).

The GA17 2019 survey was completed on 7/2/2019 which was a period of dry weather; the survey was conducted eleven (11) days after 0.93” rain fell at Taunton Airport (KTAN). The growing area was in the open status during the 2019 survey.

Table 1: Fecal coliform results for sources sampled in 2019 survey.

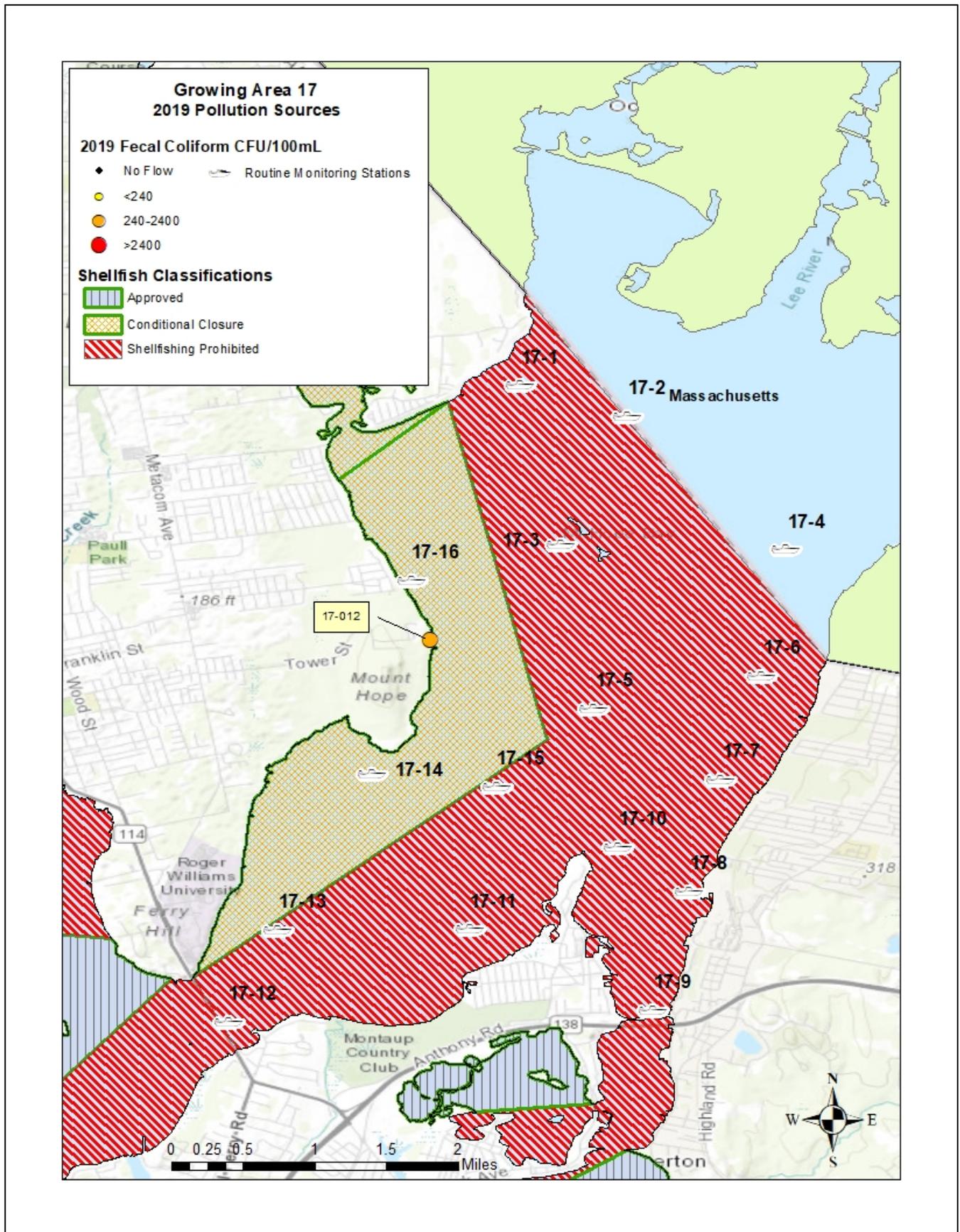
Source ID	Date	Lat	Long	Description	Classification	Actual / Potential	Direct / Indirect	2018 Results cfu/100 ml	2019 Results cfu/100 ml	2019 Flow (cfs)
17-012	7/2/2019	41.6772	-71.2357	Small stream	CA	A	D	>1,600	300	0.002

The 2019 annual survey sampled one (1) source: source 17-012. Source 17-012 is a small stream (0.002 cfs flow) that flows into the conditionally approved waters of Mt. Hope Bay (Figure 2). This source had elevated results during the 2018 survey, but a fecal coliform concentration of 300 cfu/100 ml was observed during the 2019 survey (Table 1). Given the low flow rate, the recent reduced fecal coliform result and the fact that the receiving waters to which this stream flows are conditionally approved and close after 0.5” rain, this source is not currently negatively affecting the microbial water quality of growing area 17. In addition, nearby monitoring station 17-16 had acceptable water quality (geometric mean of 3.1 cfu/100 ml and 0% of recent 15 observations exceed 31 cfu/100 ml) during 2019, further demonstrating that this source is not negatively impacting the fecal coliform water quality of GA17 when the area is in the open status.



Figure 2: Source 17-012

Figure 3: 2019 Mt Hope Bay Growing Area 17 Pollution Sources and monitoring stations.



3. Mooring Fields and Marinas

There are two marinas located along the northeastern shore of Portsmouth within the prohibited portion of Mount Hope Bay growing area. There are approximately 400 slips for a variety of vessels at these two marinas. There is a pump out facility located at the larger of the two marinas (Brewer's Sakonnet Marina) that services the marine sanitation devices on these boats. All RI waters are designated as a "No Discharge Zone". The dilution calculations used to establish marina closures can be found in the programs permanent file and are tabulated in the document entitled "Marina Dilution Analysis Background, June 2017".

Information regarding the "No Discharge Zone" enforcement and inspection procedures for vessels operating in RI waters can be found on our website by following this link:

<http://www.dem.ri.gov/programs/water/shellfish/marine-pumpouts.php>

4. Wastewater Treatment Facilities (WWTF)

There are three permitted non-sanitary water release pipes within the Rhode Island portion of the growing area. The Brayton Point power station formerly had a cooling water discharge into Mt. Hope Bay, but the plant has ceased operation as of June 1, 2017 and no longer discharges cooling water to the growing area. There are several sanitary discharges from wastewater treatment plants in the Massachusetts portion of the watershed to Mt. Hope Bay. The plants closest to the growing area are the Fall River Wastewater Treatment Facility (WWTF) approximately 2 miles from the growing area, the Somerset WWTF (~ 3 miles upstream of the GA) and the Taunton WWTF (approximately 16 miles up the Taunton River from the growing area). These sources potentially could have a significant impact on the status of the growing area and are the main impediments to shellfishing in these waters.

Consequently, the majority of Mount Hope Bay is classified as "Prohibited" in which shellfishing is not allowed. This prohibited area was originally established along the eastern and southern sides of the bay as a necessary closure in the case of a failure of the Fall River WWTF. Hydrographic time of travel dye studies in November 1989 (Rippey and Watkins, 1988) helped to originally establish the prohibited area and more recent hydrographic dye studies (FDA, 2018) have verified the suitability of the prohibited zone in the RI portion of Mt. Hope Bay (GA17). A dye study also has verified that there is sufficient dilution between the Somerset WWTF and the conditionally approved waters of GA17 to be protective of public health in the event of loss of disinfection at the Somerset WWTF (FDA, 2017). The recent FDA hydrographic dye study was completed in cooperation with FDA that assessed both the Fall River and Somerset WWTF impacts on this growing area. The final report was completed in June of 2017. The recommendations for management of this conditionally approved harvest area that are contained within this recently completed report (FDA, 2018) confirm that the existing closure area provides adequate protection in the event of an upset in operations at the Fall River or Somerset WWTF. The 2017 FDA report also included a recommendation for adding a 6 MG Fall River WWTF bypass closure criteria to enhance protection of GA17. This additional closure criteria is to protect public health in the rare event of a 6 MG or larger bypass under rainfall of less than 0.5" (GA17 is managed with a 0.5" in 24 hour rain closure criteria). This added closure criteria was incorporated into the 2019 GA17 Conditional Area Management Plan update.

A review of EPA ECHO DMR data for the Fall River WWTF indicated that average flow was 27.1 MGD during 2019 compared to a permitted value of 30.9 MGD. The Fall River WWTF had no flow or fecal coliform violations during 2019. Treated effluent fecal coliform concentration was typically less than 10 cfu/100 ml, well below the permitted limit of 200 cfu/100 ml. The 2019 review demonstrated that the Fall River WWTF was discharging treated effluent within permitted limits and is not impacting GA17 water quality outside of the closed (Prohibited to shellfish harvest) WWTF safety zone.

In addition to identifying fecal coliform sources, all actual and potential pollution sources discharging or having the potential to discharge to shellfish waters were evaluated for the likelihood of poisonous or deleterious substances that may adversely affect a growing area. Growing Areas with the potential to be impacted by poisonous and deleterious sources from existing and legacy sources have been established and classified as Prohibited. The likely sources of these substances are industrial discharges, seepage from waste disposal sites, or agricultural lands. Prohibited areas were established based on land uses within the watershed, consultation with DEM's Office of Waste Management, in situ water column, sediment and shellfish testing. Natural toxins such as those produced by phytoplankton are addressed through routine harmful algae monitoring according to the program's HAB Monitoring and Contingency Plan, RIDEM August 2017.

At the time of the shoreline survey, identified sources and immediately adjacent upland areas are visually inspected for any indications of activities having the potential to contribute poisonous or deleterious substances. Further evaluation is conducted during background watershed analysis when developing the shoreline survey report. Follow-up sampling or further field work and evaluation is conducted as warranted. There were no indications that any of the sources identified during this survey have the potential to impact the approved waters of Growing Area 17 due to poisonous or deleterious substances at harmful levels that would be of concern and cause a public health risk.

5. Water Quality Studies

The RIDEM Shellfish Program participates in the Shellfish Growing Area Monitoring (SGAM) program, which is the result of an agreement between the State of Rhode Island and the Food and Drug Administration (FDA), and managed by the National Shellfish Sanitation Program (NSSP). The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry. The NSSP is designed to oversee the shellfish producing states' management programs and to enforce and maintain an industry standard. As part of this agreement, the state of Rhode Island is required to conduct bacteriological monitoring of shellfish harvesting waters for direct human consumption in order to maintain certification.

Water samples are collected at sixteen (16) monitoring stations throughout the growing area. Two (2) stations are located in the conditionally approved waters of GA17 while fourteen (14) monitoring stations are located in prohibited waters (Figure 3). The extensive prohibited waters of GA17 are part of the closed safety zone for the Fall River WWTF (see Growing Area 17 Conditional Area Management Plan).

Water samples are collected 1-2 feet below the water surface using 125 ml (4-ounce) sterile Nalgene bottles after which they are stored in a cooler packed with ice. They are then transported to the Rhode Island Department of Health Laboratories for analysis. Since June 2012, RIDOH has analyzed samples using the mTEC membrane filtration method; all samples used to calculate compliance statistics were analyzed by the mTec method. Fecal coliform results are sent to the RIDEM Shellfish Program at which time they are reviewed and incorporated into a database. Shellfish growing area fecal coliform data are analyzed and compliance statistics are calculated annually. A summary of these statistics and related commentary is below.

2019 Review and Statistical Summary of Growing Area 17:

HIGHLIGHTS

- * Mt. Hope Bay (Growing Area 17) was sampled ten times during the 2019 season (9X during 2019, 1X during January 2020).
- * For conditionally approved stations, statistics represent recent 15 samples when area was open during 5/15/2018 to 1/8/2020.
- * Prohibited station summary statistics calculated for informational purposes only.
- * All conditionally approved stations are in program compliance.
- * All samples analyzed by mTEC method.
- * Data run 2/13/2020.

COMMENTARY

Mt. Hope Bay (Growing Area 17) was sampled nine times during 2019 and once during January 2020. All 2019 season samples were collected when the area was in the open status. Frequent wet weather during 2019 prevented collection of 12 sets of samples when the area was in the open status (< 0.5" rain in prior seven days). For example, the growing area was open only 2.5 days during April 2019 and the area was open only six (6) days, of which only three (3) were lab-open weekdays, during December 2019. Double sets of samples were collected during May and July 2019 and an added set of samples was collected during early January 2020 to compensate for the sampling opportunities missed due to wet weather.

Sixteen (16) stations are sampled in Mt, Hope Bay, with two stations classified as conditionally approved and the remainder classified as prohibited. The 2019 review demonstrated that both conditionally approved stations (17-14 and 17-16) in the Mt. Hope Bay (Growing Area 17) meet criteria and are in program compliance. The 2019 statistical review also demonstrated that 13 of 14 stations in the growing area that are classified as prohibited also met criteria. These stations are classified as prohibited due to time of travel of a potential bypass or upset at the Fall River wastewater treatment facility.

The 2019 review demonstrated that the conditionally approved stations (17-14 and 17-16) in the Mt. Hope Bay (Growing Area 17) meet NSSP criteria and are in program compliance. The area is properly classified.

RECOMMENDATIONS

- * No other actions recommended based on ambient monitoring results.

RIDEM SHELLFISH GROWING AREA MONITORING: GA17

Recent 15 when open.

(5/15/2018 to 1/8/2020, all mTEC, all dry weather)

FECAL-GEO

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>MEAN</i>	<i>%>CRITICAL 31 cfu/100 ml</i>
GA17-1	P	15	3.3	0.0
GA17-2	P	15	3.1	0.0
GA17-3	P	15	5.0	13.3
GA17-4	P	15	2.8	0.0
GA17-5	P	15	2.6	0.0
GA17-6	P	15	2.7	0.0
GA17-7	P	15	3.0	0.0
GA17-8	P	15	2.4	0.0
GA17-9	P	15	2.4	0.0
GA17-10	P	15	2.4	0.0
GA17-11	P	15	2.5	0.0
GA17-12	P	15	2.8	0.0
GA17-13	P	15	2.6	0.0
GA17-14	CA	15	2.4	0.0
GA17-15	P	15	2.4	0.0
GA17-16	CA	15	3.1	0.0

6. Conclusions and Recommendations

The 2019 review documented that there are no shoreline pollution sources that are negatively impacting the fecal coliform water quality of the growing area. The 2019 review of the WWTF discharging to the growing area demonstrated that WWTF are well-run and are discharging effluent within permitted fecal coliform concentration and flow rates. The 2019 review of fecal coliform water quality data indicated that all monitoring stations in the growing area meet NSSP criteria while in the open status.

A review of the current GA17 Management Plan was conducted to ensure compliance and accurate representation of current procedures related to the operation and management of GA17. This assessment indicated no significant deviations from the GA17 management plan. The sources identified and sampled as part of the 2019 annual update of GA17 indicated that the impact of the sources on the water quality of Mount Hope Bay GA17 was minimal and that no changes in the growing area classification are recommended.

The 2019 update has demonstrated that the area is properly classified. No changes in classification are recommended.

7. Literature Cited

- FDA, 2017. Evaluating the Dilution of Wastewater Treatment Plant Effluent, Treatment Efficiency, and Potential Microbial Impacts on Shellfish Growing Areas in Somerset, MA. Report of Findings from the September 8 – 19, 2014 study period. US Food and Drug Administration Assistance and Training Project. 41 pages.
- FDA, 2018. Evaluating the Dilution of Fall River Wastewater Treatment Plant Effluent, Treatment Efficiency, and Potential Microbial Impacts on the Shellfish Growing Area in Mount Hope Bay, Massachusetts and Rhode Island. Report on findings from the December 3-1-, 2013 study period. US Food and Drug Administration Assistance and Training Project. 20 pages.
- RI DEM, 2019. Conditional Area Management Plan for Mt. Hope Bay (Growing Area 17), 2018 revision. Copy on file in the DEM, OWR, Shellfish Program's permanent files.
- Rippey, SR and Watkins, WD. 1988. Mt. Hope Bay sanitary survey – microbiological – 1986-1987. Final report. US Public Health Service, Food and Drug Administration, Northeast Technical Services Unit, Davisville, RI. 104 pages.